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MIHARA (Y.). **Dispersion of the Larvae of *Chilo simplex*, Butl.** [*In Japanese.*]—*Oyo-Dobuts. Zasshi* [*J. appl. Zool.*] **1** no. 2 pp. 81–89. Tokyo, 1929.

Newly hatched larvae of *Chilo simplex*, Butl., bore into the stalks of the rice plants on the leaves of which the eggs were laid. Later, especially when half grown, they disperse, often migrating several times to new stalks, though they seldom travel further than about 5 ft. In Japan, migration rarely occurs from November onwards.

KURIHARA (S.). **Number of Eggs produced by the Rice Borer, *Chilo simplex*, Butl.** [*In Japanese.*]—*Oyo-Dobuts. Zasshi* [*J. appl. Zool.*] **1** no. 3–4 pp. 174–181. Tokyo, 1929.

The number of eggs produced by a female of *Chilo simplex*, Butl., is closely related to the size of its body. In 78 per cent. of the moths, oviposition begins a day after emergence, about 26 per cent. of the eggs being laid in the first oviposition and less in subsequent ones, which occur at intervals of 1–3 days.

KOIDSUMI (K.). **Experimental Studies on the Influence of low Temperatures upon the Development of Fruit-flies. Third Report. On the Velocity, favourable Temperature and Threshold of Development of the Pupae, Eggs and Larvae of the Melon Fly (*Chaetodacus cucurbitae*, Coq.).** [*In Japanese.*]—*J. Soc. trop. Agric.* **5** no. 2 pp. 131–154, 8 graphs, 20 refs. Taihoku, Formosa, June 1933.

In this further report [*cf. R.A.E.*, A **21** 104], it is concluded from experiments that the range of temperature favourable to the development of the eggs and larvae of *Dacus* (*Chaetodacus*) *cucurbitae*, Coq., lies between 14 and 32°C. [57·2–89·6°F.] and of the pupae between 16 and 30°C. [60·8–86°F.], while the range at which development is possible is 12–34°C. [53·6–89·6°F.] for the former two and 10–36°C. [50–96·8°F.] for the latter.

MASAKI (J.). **On the Life-history of *Tipula aino*, Alexander (Tipulidae, Diptera).** [*In Japanese.*]—*Agric. & Hort.* 1933 nos. 6–8 pp. 1441–1450, 1649–1656, 1657–1665, 12 figs. Tokyo, June–August 1933.

All stages are described of *Tipula aino*, Alexander [*cf. R.A.E.*, A **20** 574], which is an important pest of rice in Japan and Korea. One generation a year is usually produced in Hokkaido, but in Kyushu there are two, the adults emerging from late March to early May and again in September and early October. The flies, which frequent moist places, feed on water and exudations of trees, and die in 2 or 3 days without food at 18°C. [64·4°F.]. They are positively phototropic at night. The eggs are deposited singly in moist soil rich in organic matter. One female lays 233–582 eggs in the course of about 5 days. The larvae hatch in 7–15 days and feed on decayed vegetable matter, the seeds, young roots and buds of rice, and various other plants in captivity, completing their growth in some 140 and 190 days in the first and second broods respectively, during which period they moult 4 times. The pupal stage last 5–8 days. Natural enemies include the dragonfly, *Gomphus melampus*, Selys, the Asilid, *Promachus yesonicus*, Big., and *Dryomyza* (*Eggizoneura*) *formosa*, Wied.

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MURAKAMI (S.). **Results of Studies on *Cylas formicarius* Fab. I.** [*In Japanese.*]—*J. Pl. Prot.* **20** pp. 979–980, 1 pl., 2 figs. Tokyo, November 1933.

All stages are described of *Cylas formicarius*, F., which causes serious damage to sweet potato in Formosa and the Loochoo and Bonin Islands. At Naha, Loochoo Islands, it breeds throughout the year, having 7 annual generations ; the eggs, which are laid one or more days after pairing, hatch in 4–6 days, the larval stage lasting 17–34 and the pupal 5–12 days.

CARTWRIGHT (W. B.). **Observations on the European Corn Borer and its Major Parasites in the Orient.**—*Circ. U.S. Dep. Agric.* no. 289, 13 pp., 3 figs. Washington, D.C., October 1933.

An account is given of observations on *Pyrausta nubilalis*, Hb., and its major parasites made in the Japanese empire and eastern China from 1928 to 1930. Besides maize, the most important food-plants [*cf. R.A.E.*, A **18** 301] were hemp (chiefly attacked by the first brood), millet [*Setaria italica*] and *Sorghum* in Honshu, Kyushu and Korea, millet in Formosa, beans [*Phaseolus*] in Hokkaido, and Chinese indigo [*Polygonum tinctorium*] in Shikoku. In Japan, where there were normally three generations (except in Hokkaido, where there were one and a partial second), the principal parasites [*cf.* **19** 144, etc.] were *Ceromasia senilis*, Mg. (*lepida*, auct.), which was generally the dominant species late in the season, *Cremastus flavo-orbitalis*, Cam. [*cf.* **21** 422], *Apanteles* sp. and *Macrocentrus gifuensis*, Ashm. [*cf.* **19** 436]. *Phaeogenes* sp. was rare, and *Microgaster tibialis*, Nees, occurred once only, both in Honshu, and four examples of *Agathis* (*Bracon*) *atricornis*, Smith, were reared in Kyushu. In Formosa were found the pupal parasites, *Xanthopimpla stemmator*, Thnb., *X. punctata*, F., and *Brachymeria* sp. In Korea, the commonest parasite was *C. senilis*, others being *Macrocentrus gifuensis*, *Angitia* (*Inareolata*) *punctoria*, Rom., *Apanteles* sp. and *Phaeogenes* sp. Those occurring in Manchuria (where the food-plants were maize, *Sorghum* and millet) were *C. senilis*, *M. gifuensis*, *Microgaster* sp., *Apanteles* sp., *Angitia punctoria* and *Eulimneria alkae*, Ell. & Sacht., of which the first two occurred also in the Peking district.

The fungus, *Beauveria bassiana*, attacked the larvae of *P. nubilalis* in the laboratory in Japan and China in 1929, and a Mermithid, *Hexamermis meridionalis*, parasitised them in Honshu.

BERAN (F.). **Eine Methode zur Feststellung der Fängigkeit von Raupenleimen. (Vorläufige Mitteilung.)** [A Method for ascertaining the Tenacity of Banding Adhesives. (Preliminary Communication.)] —*Z. PflKrankh.* **44** no. 1 pp. 41–44, 1 fig., 4 refs. Stuttgart, 1934.

It is difficult to ascertain to what degree a banding adhesive preserves the power of trapping and retaining larvae, as material that has formed a surface-film may remain sticky while allowing insects to pass over it. Certain methods [*R.A.E.*, A **19** 615 ; **20** 9] gauge only adhesiveness, and the use of living caterpillars [**20** 615] presents difficulties.

In the apparatus here described, the adhesive is spread on a sloping wooden surface, and a roller is drawn from the bottom to the top of the slope by a cord passing over a pulley above and actuated by a counterweight. The surface of the roller is grooved parallel to its axis, so that its

section is that of a cog-wheel with the tips of the cogs flat. As the roller revolves, the cogs provide intermittent contact with the adhesive, thus simulating the crawling of a caterpillar.

HART (P. C.). **Topstekuitlevering en topboorderbestrijding.** [The Supply of Sugar-cane Tips for Setts and the Control of the Tip-borer.]—*Arch. Suikerindustr. Ned.-Ind.* 1933 no. 22 pp. 681–592, 1 pl. Soerabaia, 1933.

Records are given showing that measures against *Scirpophaga intacta*, Sn., in Java result in an increased supply of sugar-cane tips suitable for setts. In one group of plantations, fields where the borer had been controlled produced 35 per cent. more setts for planting than those where no measures had been applied.

VIVIEN (G.). **Note sur la destruction des moisissures et des insectes nuisibles aux collections.**—*Bull. Soc. Sci. nat. Seine-et-Oise* (3) **1** no. 5–6 pp. 81–82. Versailles, 1933.

The formula of a fumigant recommended against insect pests of collections is 10 gm. chloroform, 1 gm. phenol crystals, 5 gm. beech creosote, 5 gm. paradichlorobenzene, and 79 gm. oil of mirbane (nitrobenzene).

REICHERT (A.). **Rosenschädlinge.** [Rose Pests.]—*Kranke Pflanze* **10** no. 12 pp. 155–157, 1 pl. Dresden, 1933.

If abundant, *Megachile centuncularis*, L., can cause injury to roses in Germany, as the female builds her brood-cells with pieces cut from the leaves. If necessary, the bees may be collected early in the morning when they are sluggish, either on the rose bushes or at their nests. The larvae of *Dasyneura rosarum*, Hardy, live in leaf-galls [*R.A.E.*, A **20** 653], of which a maximum of 50 on one leaf has been observed by the author, and pupate in the soil. This Cecidomyiid, which appears to have two generations a year, may be controlled by destroying the infested leaves.

MACDOUGALL (R. S.). **Insects and Other Animal Pests of 1932.**—*Trans. Highl. agric. Soc. Scot.* (5) **45** pp. 46–80 (reprint 36 pp.), 12 figs. Edinburgh, 1933.

This paper includes notes on the bionomics of *Leptinotarsa decemlineata*, Say, in view of its appearance in southern England [see next abstract], and on recent developments in the control of *Hylobius abietis*, L. [*R.A.E.*, A **21** 23], which is a serious pest of conifers in Britain, and *Byturus tomentosus*, F., on raspberries and loganberries [**21** 294, etc.].

FRYER (J. C. F.). **Colorado Beetle at Tilbury.**—*J. Minist. Agric.* **40** no. 10 pp. 907–912, 1 pl. London, January 1934.

The Colorado potato beetle [*Leptinotarsa decemlineata*, Say] was found for the first time in Britain since 1901, when a crushed adult was discovered at Tilbury on 21st August 1933 and 2 living ones in the soil of an allotment half a mile away on 23rd August [*R.A.E.*, A **21** 492]. A rapid survey of all field crops of potato within a radius of about

10 miles was undertaken to determine whether a large infestation was present in the district and to discover the crops that were still growing and favourable to the beetle. Those that were green and likely to remain attractive for some weeks were sprayed with an arsenical, 2,007 acres being treated. Except for certain trap rows, the plants on the site of the outbreak were dug up and the haulms burnt. Carbon bisulphide was injected into the soil of the allotment in which the beetles had actually been found, and on 9th October the whole area was treated, resulting in the discovery of 7 further beetles, which were evidently in the soil at the time of the inspection of the foliage in August and September. Examination of the soil in neighbouring allotments revealed the presence of the beetle in some ; in all these, the soil was fumigated and also in intervening plots. Judging by the mortality caused to other soil insects, it is probable that most, if not all, the beetles remaining in the areas known to be infested were destroyed.

Although the beetles were found near the site of the 1901 outbreak, it is scarcely possible that infestation could have survived undetected in this area, and it is suggested that they were the progeny of a female that reached Tilbury by ship.

BARNES (H. F.). **Another Basket-willow Pest.**—*J. Minist. agric.* **40** no. 10 pp. 923–925, 2 pls. London, January 1934.

The morphology and bionomics of *Dizygomyza barnesi*, Hendel, on willows in England, are dealt with in less detail than in a previous paper [*R.A.E.*, A **21** 562]. The tunnels of the larvae weaken the rods and render about the bottom 3 ft. useless for basket-making or for setts. The larvae usually tunnel downwards until the end of July, when they make their way upwards in preparation for pupation in August and early September. In experiments, oviposition and larval development occurred on *Salix caerulea* (cricket-bat willow), which may apparently serve as a food-plant occasionally. No satisfactory artificial control measure has yet been found ; the pupal stage is considered the most vulnerable.

ARION (G.). **Rumania : The San José Scale.**—*Int. Bull. Pl. Prot.* **7** no. 12 pp. M271–M272. Rome, December 1933.

Aspidiotus perniciosus, Comst., is reported from eight districts in Rumania, in some of which it has been established for several years and in others for one or two only. It is spreading from west to east, having probably been introduced from Austria or Hungary, where it has been known for some time [*cf. R.A.E.*, A **20** 506, etc.].

MALENOTTI (E.). **Gli afidi del pesco.** [The Aphids infesting Peach.]—4 pp. Verona, Oss. fitopat. Veneto, 1933. [Recd. January 1934.]

Peach was severely attacked by Aphids in Venetia in 1932 and 1933, the most abundant being *Anuraphis* (*Brachycaudus*) *persicae-niger*, Smith, *A.* (*Appelia*) *schwartzi*, Börner [*cf. R.A.E.*, A **19** 379], and *Hyalopterus arundinis*, F. *Myzus persicae*, Sulz., and *Anuraphis forbesi*, Weed, were less important. Direct injury was aggravated by the subsequent development of sooty mould. The sprays used for control, which are very briefly discussed, included a preparation called quassina that appears to prevent the young Aphids from attaching

themselves to foliage covered with it. Such an effect is known to occur with lime-sulphur in the case of first-instar larvae of Diaspine Coccids.

MALENOTTI (E.). **Irrorazioni arsenicali e apicoltura.** [Arsenical Sprays and Apiculture.]—*Terzo Congr. naz. Sez. Apic. ital.* Forlì-Ravenna 29 ott.–1 nov. 1933, reprint 13 pp., 4 diagr., 9 refs. Trento, 1933.

In view of the alarm with which bee-keepers in Italy have regarded the increasing use of arsenical sprays against *Cydia pomonella*, L., and other orchard pests, the author discusses work done with such sprays in Italy, Switzerland and the United States, and concludes that no danger to bees is involved if the insecticide is applied after all the petals have fallen.

MORRIS (H. M.). **Potato Tuber Moth** (*Phthorimaea operculella*, **Zell.**).—*Cyprus agric. J.* **28** pt. 4 pp. 111–115, 1 fig. Nicosia, December 1933.

Phthorimaea operculella, Zell., is found in Cyprus wherever potatoes are grown, being a more serious pest of this crop than of tobacco, of which it attacks the leaves and stems, or of tomato, of which it also infests the fruit. Brief descriptions are given of the stages. At 80–85°F. the life-cycle from oviposition to emergence occupies 21 days, but during the winter, at 55–62°F., the pupal stage alone may last 50 days. The females lay about 150 eggs singly or in batches of 3–4. When they are laid on the lower surface of the leaves or on the shoots, the larvae cause the formation of dry, brown, blistered areas by feeding within the leaflets, which may die, or kill the parts of the plant above the point of entry in petioles or thin stems. When the eggs are laid on the tubers, in cracks in the skin or round the eyes, the larvae construct tunnels, at first near the surface but later more deeply, which facilitate the entrance of fungi and bacteria. Successive generations are able to breed within the tubers, infestation of which is most serious in storage. The presence of the larvae is usually indicated by small mounds of frass ejected from the burrows. Control measures, which are discussed, aim chiefly at protecting the tubers from ovipositing females in stores or in fields during harvest, or when uncovered by cracks in the soil owing to lack of careful irrigation or cultivation. Larvae may migrate to tubers placed in heaps or baskets after harvesting if they are covered with leaves and stems and may also penetrate the cracks in the soil of dry ground and attack tubers ready for harvest [*cf.* also *R.A.E.*, A **20** 437].

MESNIL (L.). **Nouvelle méthode de lutte contre les insectes par l'emploi de substances insectifuges.**—*C. R. Acad. Agric. Fr.* **20** no. 1 pp. 29–33. Paris, 1934.

A brief account is given of preliminary field experiments carried out in France in 1933 in protecting beet from *Pegomyia hyoscyami*, Panz., and cauliflowers from *Contarinia torquens*, de Meij., by spraying with repellents to prevent oviposition on the plants by flies of the first generation. Each of the 17 substances tested was mixed with ground-nut oil (1 : 9), the mixture being afterwards emulsified in water at the rate of 2 per cent. by means of ammonium oleate. The oil was added to retain the odour of the repellent, and also as a solvent and spreader.

The sprays were applied in late June against *Pegomyia* and in early July against *C. torquens* [*cf. R.A.E.*, A **19** 274], and promising results were obtained, particularly with creosote or naphthalene against both flies and with pyridine against *C. torquens*. As a few cauliflowers that were infested at the time of treatment partly recovered and subsequently produced blossoms, the oil apparently also acted as an insecticide.

MEYER (A.). **Sur l'emploi des sels du dinitrophénol et du dinitrocrésol comme anticryptogamiques et parasiticides.**—*C. R. Acad. Agric. Fr.* **20** no. 1 pp. 43–46, 2 refs. Paris, 1934.

Attention is drawn to the danger to man involved in the use of preparations containing dinitro-ortho-cresol or dinitro-phenol in dormant sprays against fungi or insect pests on fruit trees [*cf. R.A.E.*, A **16** 583 ; **17** 426, 672 ; **19** 697, etc.]. In tests on animals, dinitrophenol was toxic at a dosage of 50 mg. per kg. of body weight, and dinitro-o-cresol was lethal at 7–10 mg. per kg., the symptoms of poisoning being similar. Prolonged handling of dinitro-phenol results in serious poisoning, owing to the gradual absorption of small quantities. A method is briefly described by means of which the presence of dinitro derivatives of phenol may be determined.

BALACHOWSKY (A.). **Sur les dégats occasionnés par la mouche des fruits (*Ceratitis capitata* Wied.) dans les vergers de la région parisienne durant l'année 1933.**—*C. R. Acad. Agric. Fr.* **20** no. 2 pp. 99–104, 7 refs. Paris, 1934.

In the summer of 1933, an outbreak of *Ceratitis capitata*, Wied., caused severe damage to late peaches and autumn pears in various places near Paris, the losses in some instances amounting to 50 per cent. of the crop. No other fruits were attacked. Previous records of the occurrence of this fruit-fly in France are briefly reviewed [*R.A.E.*, A **17** 285 ; **18** 461, etc.]. On the basis of Bodenheimer's theory [**13** 389] that the threshold of development for *C. capitata* is 13·5°C. [56·3°F.], the author reckons that in the Paris district the fly could normally have two annual generations ; in 1933, owing to the exceptionally hot summer, there was probably a third.

The only effective remedial measure is the use of bait-traps containing bran and water [**19** 276, etc.], but in the Paris region it is sufficient for the present to bury all infested fruit in the soil at a depth of 30 ins.

VINSON (J.). **Le papillon des arbres à épines *Papilio demodocus*, Esper.**—*Rev. agric. Maurice* no. 71 pp. 161–165. Mauritius, 1933.

Notes are given on the bionomics in Mauritius of *Papilio demodocus*, Esp., all stages of which are described. This butterfly, which was first recorded in the Island in 1870, is probably an introduced species ; the author has intercepted two or three larvae and one pupa on young orange trees imported from Madagascar. The regular food-plants are all rutaceous, *Citrus* being a preferred one. The eggs, which are laid on any part of the plant, but preferably on young shoots, hatch in 5 days, and the larval stage lasts about 18. The chrysalids are attached to a branch of the main stem of the food-plant. The adults emerge after 14–20 days, or as long as 143 days from overwintered pupae. The damage caused is usually not very great, being confined to

seedlings and young plants, but during outbreaks trees may be completely defoliated.

Hand-collection of eggs and larvae is usually sufficient for control. During outbreaks, a spray of lead arsenate (1 lb. in 50 gals. water) or Paris green (½ lb. with 1 lb. lime in 100 gals. water) kills the larvae in a few hours and protects the leaves from attack for several weeks, but Paris green sometimes scorches the foliage. There are practically no natural enemies, though eggs that had apparently been parasitised have been observed in the field. The larvae are not attacked by birds owing to their protective coloration and the odour they emit when disturbed.

DE PEYERIMHOFF (P.). **Les coléoptères attachés aux conifères dans le Nord de l'Afrique.**—*Ann. Soc. ent. Fr.* **102** pp. 359–408, many refs. Paris, 1933.

This work, which is largely based on previously published notes by the author on the biology of Coleoptera occurring in Algeria and Morocco, deals with species found in coniferous forests, which cover an area of about 5,800 sq. miles in Algeria alone. The species of conifers are grouped systematically, and under each are given classified lists of the beetles found on it, distinguished as attacking healthy or decayed wood, feeding on leaves, flowers or fruits, or on fungi, or predacious on, or associated with, the injurious ones. The beetles and their food-plants are then tabulated, and a list is given of those occurring on deciduous trees as well as conifers. A separate chapter deals with factors affecting the selection of certain food-plants, or groups of plants, by certain insects, including previous infestation by other species and climatic and geographical factors. The composition of the Coleopterous fauna of different conifers in northern Africa is discussed in detail, long established and widespread species being distinguished from more recent local ones. The last chapter deals with the theory of " host-selection " suggested by Hopkins [*cf. R.A.E.*, A **10** 83, etc.].

SCHOUTEDEN (H.). **Un coccide dangereux.**—*Bull. Cerc. zool. congol.* **10** fasc. 2 pp. (40)–(41) in *Rev. Zool. Bot. afr.* **24**. Brussels, 22nd December 1933.

Aspidiotus destructor, Sign., is recorded on oil palm, *Elaeis* [*guineënsis*], in the Belgian Congo [*cf. R.A.E.*, A **3** 649].

SMEE (C.). **Report of the Entomologist.**—*Rep. Dep. Agric. Nyasaland 1932* pp. 48–52. Zomba, 1933. [Recd. January 1934.]

The first invasion of locusts in Nyasaland for over 20 years occurred on 24th–25th January 1932, when a swarm of *Locusta migratoria migratorioides*, R. & F., entered the north of the Protectorate from Tanganyika Territory. Oviposition occurred immediately, but the hoppers, which were present by 19th February, were controlled by prompt measures and possibly by adverse weather conditions, and the damage caused was comparatively negligible. Several large flying swarms were again recorded between 21st November and 14th December. The majority oviposited almost immediately over wide areas, and by the middle of December hopper swarms were extremely numerous. Invasion by large migratory flights from Mozambique occurred from 26th August and throughout September. Eggs were laid in November,

and by the middle of December large numbers of hopper swarms were present. The damage caused to food crops was, however, slight. At the end of December large swarms of mature adults of *Nomadacris septemfasciata*, Serv., migrated from north-eastern Rhodesia, and eggs had been laid in all districts by the end of January 1933. Early in this month, additional swarms of both species (*Nomadacris* predominating) arrived from the Zambesi valley and oviposited almost immediately.

Though *Vernonia* op. is the only plant known to harbour the virus of the disease causing "cabbaging" (leaf-curl) of tobacco, to which it is transmitted by *Bemisia* sp. [*cf. R.A.E.*, A **21** 106, etc.], it is probable that others do so, as considerable infection occurs in areas where this weed is scarce or apparently absent. The presence of old, abandoned tobacco plants encourages the breeding of the Aleurodid, which may continue during a greater part of the year, if not throughout it. Diseased plants should be removed from the field and buried or burned to kill the larvae and pupae. Damage is caused to tobacco in the nursery and the field by *Dereodus recticollis*, Mshl., the adults of which feed on a large number of plants and weeds [*cf.* **16** 75]. Exposed nurseries are less subject to infestation by this weevil than those with much surrounding vegetation. Lightly raking the beds after sowing appears to prevent *Pheidole megacephala*, F., from removing the seed. *Myzus persicae*, Sulz., has been unusually abundant on tobacco during the past few seasons. The importance of dealing with tobacco pests before they have migrated to the field from the nursery, where they can be controlled more easily, is emphasised.

Pests of tea, in addition to *Helopeltis bergrothi*, Reut. [**21** 153], were *Aspidiotus rapax*, Comst., which chiefly attacked bushes on poor soil, and *Coccus hesperidum*, L., a heavy infestation of which occurred in February on plants that were growing in poor soil and had been damaged by mites, but was controlled by parasites in a few weeks. An unusual outbreak of *Diarthrothrips coffeae*, Will., on coffee during March-April before the end of the rains, which was rapidly controlled by a nicotine spray, may have been due in part to packing of the soil below the surface. From the abnormal abundance of *Anthores leuconotus*, Pasc., unusually late in the season and the finding of small grubs that had not entered the coffee stems below ground level up to the end of July, it is apparent that emergence continues over a long period or occurs at varying times; consequently, the absence of the adults early in the season does not necessarily indicate slight infestation.

Trioza merwei, Pettey, which sucks the cell sap from *Citrus* leaves and may cause the foliage on certain branches to become strikingly crumpled and yellow, can be controlled by repeated applications of soap or nicotine directed to the lower surface of the leaves under strong pressure. These sprays will also control *Aphis tavaresi*, Del G. Eggs and larvae of *Argyroploce leucotreta*, Meyr., were taken on tangerines during March–April, and considerable damage was caused to the fruit, from which the eggs should be hand-picked.

A Chrysomelid has been of some importance since 1930–31 on *Indigofera endecaphylla*, which is used as a soil cover among permanent crops. The adults appear soon after the onset of the rains and lay an average of 15 eggs (which hatch in 7–10 days) on the leaves, on which the larvae feed. The larval period occupies about 4 weeks and the pupal about 7 days. Large numbers of larvae and adults are present in January–February. The larvae of a Carabid prey on the grubs. Some areas were defoliated, but the crop completely recovered, and in the season

1932–33 no signs of infestation were observed. Other pests that are active over a longer period and may be more serious are a Halticid, which injures the foliage at the same time as the Chrysomelid, and larvae, probably of a Pyralid, which spin together bunches of the leaves on which they feed.

Mossop (M. C.). **Further Notes on the Biology of the Red Locust.**—*Rhod. agric. J.* **30** no. 12 pp. 1007–1010, 1 ref. Salisbury, S. Rhodesia, December 1933.

In continuation of his previous observations in Southern Rhodesia [*R.A.E.*, A **20** 643, 672], the author noted that the stragglers left behind by a passing swarm of *Nomadacris septemfasciata*, Serv., as well as individuals taken from a swarm and caged, undergo a change in coloration distinct from that occurring at sexual maturation, the red colour altering on the body to pale brown with prominent whitish stripes and persisting only on the hind wings. Such stragglers remain in the same locality for considerable periods, probably either joining passing swarms or producing small local outbreaks in the next generation. At the time of sexual maturation, the body-colour of locusts kept in partly shaded or in sunlit cages turned a dark Cologne-earth shade, the stripes being pale brown to sepia. Numerous Cologne-earth to black specimens were received from the field, and it is suggested that this colour is the manifestation of sexual maturation in individuals that have taken no part in migration.

Caged locusts that reached the adult stage in April oviposited in early November. It is suggested that such early maturation was brought about by the microclimate of the cage [*cf.* **21** 627–8] and that a similar phenomenon occurs in solitary locusts and stragglers that remain inactive in the moist microclimate formed by grass.

Ramachandra Rao (Y.). **Mekran—possibly the Country of Origin of the great Locust Invasion of Sind in 1926.**—*Indian J. agric. Sci.* **3** pt. 5 pp. 833–846, 2 pls., 2 maps, 12 refs. Calcutta, October 1933.

An analysis of the movements and breeding of locusts [*Schistocerca gregaria*, Forsk.] in Baluchistan and the adjoining areas in 1926 and 1931 [*cf. R.A.E.*, A **19** 136, 415, etc.], and a study of records for the intervening years, show that the swarms generally move east and north-east in spring, east and south-east in summer, and west, south-west and north-west in autumn, presumably towards the areas of seasonal rainfall. It is probable that some of the autumn swarms usually reach Persia and pass the winter there, returning eastwards in the spring, possibly together with swarms of Persian and Arabian origin [*cf.* **21** 159].

The summer breeding areas of 1926 can be divided into a western group, including Las Bela and Karachi, and an eastern one, comprising the desert tracts of the Thar-Parkar district (Sind) and Mallani (Rajputana). The invasion of the former group may have been of local origin, for the solitary phase may have existed along the Indus Valley during 1920–25 and multiplied rapidly to form the swarming phase during the abundant spring rainfall of 1926. On the other hand, the swarms that invaded both the eastern and the western areas may have originated in Makran, where there were outbreaks in 1923 and 1926 and where solitary individuals have been found breeding in sandy areas called "reks," which extend along the Makran Coast of Baluchistan and

probably into the Persian Makran and along the Persian and Arabian sides of the Persian Gulf. The vegetation and climatic conditions of the " reks " are described, and the latter are correlated with locust breeding, which was found to be closely connected with rainfall. It is suggested that eggs were laid in the Makran " reks " after the heavy rains of January 1926 and that the resulting generation, which reached the adult stage in March–April, oviposited either there or further inland in Kulanch, producing offspring of the *gregaria* phase that appeared as adults in June–July and, after migrating eastwards, initiated a recurrent annual infestation, which reached its maximum in 1929 and lasted till November 1931.

KARANDIKAR (K. R.). **A preliminary Note on the Breeding Grounds of the Desert Locust** (*Schistocerca gregaria* **Forsk.**) **in Baluchistan.**—*Indian J. agric. Sci.* **3** pt. 5 pp. 847–850, 1 pl., 1 ref. Calcutta, October 1933.

The author describes the general conditions and vegetation in the valleys of the mountain ranges of Baluchistan, which may serve as temporary breeding areas of *Schistocerca gregaria*, Forsk., and in the sandy " reks " of the Baluchistan coast, which are permanent breeding grounds of the solitary phase. In field observations, the life-cycle of this locust occupied 6–7 weeks, and since there is a correlation between rainfall and breeding, it is suggested that a quick succession of rainy seasons may lead to mass multiplication and the subsequent formation of swarms [see preceding abstract].

FRANCIS (C. B.). **A Note on the Sugarcane Leaf Hopper** (*Pyrilla*) **in South Arcot District.**—*Madras agric. J.* **21** no. 12 pp. 510–514. Madras, December 1933.

In the South Arcot District (Madras), sugar-cane has been attacked for some years by *Pyrilla*, which was unusually abundant in 1932 and constituted a major pest in 1933 for the first time. The conditions under which the cane is grown and the susceptibility of the different varieties are discussed. The foliage becomes discoloured and covered with excreta on which the fungus *Capnodium* grows, and the plants are stunted. Infestation first appeared in August, was most severe in September, which was unusually hot and dry, and was still serious in some areas at the beginning of November. Control measures were begun early in September, all trash being previously removed from the fields. An experiment showed that kerosene emulsion would not be economic for use on a large scale, apart from the difficulty of spraying the nymphs, which shelter on the lower surface of the leaves [*R.A.E.*, A **5** 556]. Trap lanterns caught an average of 2,000 of the adult insects nightly, but their use was discontinued owing to the number that would have been necessary to reduce appreciably the millions present. The adults are attracted to bungalows at night, but remain on the white walls and do not fly close to the lamps. Over a period of 7 weeks, an average of 58 coolies with nets caught over 530 millions, and an average of 73 women and children destroyed nearly 12 million egg-masses, representing about 412 million eggs, by squashing them between the fingers. A decrease in infestation observed is thought to be due more to the weather than to the control measures, which probably did not reduce the total population to any appreciable extent.

A nymphal parasite, *Dryinus pyrillae*, Kieff., was rare, but a Chalcidoid egg-parasite increased in numbers after the beginning of the control measures, a maximum of 75·77 per cent. parasitism of the egg-masses being recorded during the third week in October [*cf.* **20** 306; **21** 673, etc.].

Atkinson (D. J.). **Entomological Research.**—*Rep. Silv. Ent. Burma 1932–33* pp. 62–67. Rangoon, 1933.

Attempts to rear larvae of *Xyleutes ceramica*, Wlk., in cages on teak [*Tectona grandis*] in Burma [*R.A.E.*, A **21** 261] were unsuccessful. Larvae aged 4–6 weeks are to be used in future, as it is apparent that the greatest mortality occurs among the very young ones. Observations indicated that the number of galleries is not a reliable criterion of the extent of infestation, as one larva may apparently make several. Instances of the life-cycle lasting both one and two years were recorded. *Hyblaea puera*, Cram., and *Hapalia machaeralis*, Wlk., have 13 generations annually, which indicates that neither of these defoliators undergoes a resting period, though the former has never been found in the field during December–March [*cf. loc. cit.*]. The finding of 12 alternative food-plants of *Hyblaea* may explain the earlier occurrence of this species in injurious numbers on teak during the rains, as compared with *Hapalia*, which probably maintains itself on old coppice shoots, etc. Two Chalcidoid parasites of the eggs of the latter and a Chalcid ectoparasite of the pupae have been found. Infestation of exported teak by *Dinoderus ocellaris*, Steph., was found to have originated in the bamboo dunnage of the ship. The galleries were mainly on the surface of the timber, and the attack is considered accidental. Examination of unused dunnage at Rangoon revealed it to be heavily infested by this Bostrychid. It was recommended that old dunnage should be replaced by clean bamboo. It appears that bamboo soaked in water is less susceptible to attack, if not entirely immune.

The development of *Calopepla leayana*, Latr., on *Gmelina arborea* was considerably retarded in one area by heavy rains in May 1932, when 200,000 ovipositing females were collected by hand. Owing to high parasitism of the first generation, no second one developed and serious defoliation did not take place. In another area, however, the trees were unable to support the large population that had carried over from the previous year, and complete defoliation resulted. The eggs were found to be attacked by a Chalcidoid. Two consignments of egg-masses of another Cassidid, *Aspidomorpha miliaris*, F., parasitised by a Proctotrupid [*cf.* **16** 101] were introduced from Malaya, but evidence has not yet been obtained of this parasite reproducing in *C. leayana*. Breeding experiments were begun with *Xyleutes persona*, Le Guillou, which was discovered in the majority of trees of a line of ornamental *Cassia renigera*. The adults emerged from the end of June to the end of October, practically throughout the rains, and eggs laid by collected moths hatched in 12 days.

Ladell (W. R. S.). **Insects injurious to Rice in Siam.**—*J. Siam Soc.*, nat. Hist. Suppl. **9** no. 2 pp. 161–172. Bangkok, December 1933.

A list is given of 45 insect pests of rice observed in Siam, with notes on the more important. These are *Thrips* (*Bagnallia*) *oryzae*, Williams,

Leptocorisa varicornis, F., *Scotinophara coarctata*, F., *Cirphis unipuncta*, Haw., *Spodoptera mauritia*, Boisd., *Schoenobius bipunctifer*, Wlk. (*incertellus*, Wlk.), rice caseworms (*Nymphula* spp. and *Cnaphalocrocis* spp.), *Hispa armigera*, Ol., and *Pachydiplosis oryzae*, Wood-Mason. Parasites of *C. unipuncta* were the Tachinids, *Carcelia kockiana*, Towns., *Prosopaea* (*Dolichocolon*) *paradoxa*, Br. & Berg., *Tachina* (*Eutachina*) *civiloides*, Baranoff, *Nemorilla* (*Alsomyia*) *anomala*, Villen., and *Gaediogonia jacobsoni*, Towns., and the Chalcid, *Brachymeria euploeae*, Westw.

NANTA (J.). **Note sur l'apparition et la destruction des chenilles de *Spodoptera mauritia*, parasite du riz.**—*Bull. econ. Indochine* **36** pp. 702–706, 2 pls., 2 refs. Hanoi, 1933.

The sources of infestation of transplanted rice seedlings in Indo-China by *Spodoptera mauritia*, Boisd. [*cf. R.A.E.*, A **20** 569] comprise larvae and pupae that have hibernated in the infested field, adults carried to the field by wind, sometimes for a considerable distance, which may be a source of serious damage by the second generation, and larvae migrating from neighbouring rice-fields, owing to lack of food or excess of water. Measures for control include collection of eggs, flooding the fields to collect the floating larvae, surrounding the infested plots with ditches filled with water to prevent the migration of the larvae, ploughing the soil after the harvest and flooding it to destroy the larvae and pupae, and combing the larvae from the plants by an apparatus described. This consists of two bamboo combs 8 ft. long fixed parallel 14 ins. apart by wooden supports. The rectangle thus formed holds open a triangular sack of mosquito netting stretched in a frame attached to the sides of the combs opposite the teeth. The apparatus is dragged by ropes over a plot in which the plants project only 10–12 ins. above the surface of the water, and at the end of the plot it is turned upside down and the action repeated. The plants are not damaged and the cost is low.

LIU (Chi-Ying) & LI (Shou-Sing). **Some preliminary Notes on the Life History of the Rice Grasshopper, *Oxya chinensis* Thunberg.** [*In Chinese.*]—*Yearb. Bur. Ent. Hangchow* no. 2 (1932) pp. 59–70, 3 pls., 5 refs. Hangchow, August 1933. (With a Summary in English.) [Recd. January 1934.]

An account is given of the bionomics of *Oxya chinensis*, Thnb., as observed in 1932 in Chekiang, where it has one generation a year. All stages are described. The eggs are laid from mid-September to early October, chiefly in the surface soil of the embankments bordering the rice-fields ; the maximum number of egg-pods (averaging 0·744 per sq. ft.) is found in those between fields of early and late varieties, as the grasshoppers feed throughout the period of oviposition. A female lays a total of about 16–100 eggs. The eggs overwinter, hatching after about 7 months in May. The nymphal stage lasts about 100 days, during which time 5 moults occur. The first adults appear at the end of July, and some live as long as 113 days. Pairing begins after 15–41 days and takes place chiefly in the latter part of August and early September ; the pre-oviposition period occupies 10–41 days. In the

rice-fields, injury is particularly severe near the embankments, the maturing ears being attacked near the base so that they wither. The chief damage, however, is caused to the seedlings by the hoppers. In the first instar they are able to leap a distance of about 20 ins. and may be controlled by means of trap-trenches filled with water and covered with a film of oil.

Chu (Joo-Tso). **The Biology and Control of the Mulberry White Caterpillar.** [*In Chinese.*]—*Yearb. Bur. Ent. Hangchow* no. 2 (1932) pp. 124–182, 6 graphs, 4 pls., 24 refs. Hangchow, August 1933. (With an Abstract in English.) [Recd. January 1934.]

Severe injury to mulberry in eastern China is caused by the Bombycid, *Rondotia menciana*, Moore [*R.A.E.*, A **19** 196], the larvae of which defoliate the trees, stunting their growth and depriving the summer and autumn broods of the silkworm [*Bombyx mori*, L.] of food. It has a maximum of three generations a year, but hibernating eggs may be laid by females of any generation, and instances often occur in which some of the eggs in a single egg-mass hatch before the winter and others hibernate. All hibernating eggs hatch at about the same period in the second half of June, irrespective of the time of deposition. About 30 per cent. of the eggs in Kiangsu were parasitised. The measures suggested for control are: hand-picking egg-masses and cocoons, spraying with croton-oil emulsion against the larvae, and protection of their natural enemies.

Liu (Chi-Ying) & Chen (Kan-Fan). **Analysis of the Stomach Contents of two Species of Frogs** (*Rana limnocharis* **and** *Rana nigromaculata*) **in the Vicinity of Kashing with special Reference to Insects.**—*Yearb. Bur. Ent. Hangchow* no. 2 (1932) pp. 183–191. Hangchow, August 1933. (With a Summary in Chinese.) [Recd. January 1934.]

The results of investigations in Chekiang in 1932 on the stomach contents of two common species of frogs, *Rana limnocharis* and *R. nigromaculata*, are given in tables, showing the kinds and numbers of invertebrates eaten and their economic importance. About 50 per cent. of the food of these frogs consists of injurious insects and less than 20 per cent. of beneficial species, chiefly invertebrates other than insects. It is therefore suggested that they should be protected and no longer used for food.

Jen (Ming-Tao). **The Damage due to** *Icerya purchasi* **Mask. in Chekiang and its estimated Loss in Hwangyen District.** [*In Chinese.*]—*Yearb. Bur. Ent. Hangchow* no. 2 (1932) pp. 199–204, 2 maps. Hangchow, August 1933. (With a Summary in English.) [Recd. January 1934.]

In Chekiang, *Icerya purchasi*, Mask., occurs chiefly along the sea coast, being especially abundant in the district of Hwangyen where it is estimated that about 6 per cent. of the total area under *Citrus* is severely infested and over 38 per cent. slightly damaged. A list is given of the numerous other plants on which it has been found, representing 8 different families.

Liu (Chi-Ying). **Notes on the Biology of two Giant Coccinellids in Kwangsi (*Caria dilatata* Fabr. and *Synonycha grandis* Thunbg.) with special Reference to the Morphology of *Caria dilatata*.**—*Yearb. Bur. Ent. Hangchow* no. 2 (1932) pp. 205–250, 2 pls., 34 refs. Hangchow, August 1933. (With a Summary in Chinese.) [Recd. January 1934.]

An account is given of observations made in May–June 1929 in eastern Kwangsi on the bionomics of the Coccinellids, *Anisolemnia* (*Caria*) *dilatata*, F., and *Synonycha grandis*, Thnb., both of which prey on an Aphid, (?) *Oregma* sp. This is an important pest of bamboo, stunting the growth and causing the stems and leaves to turn yellow ; it is often associated with sooty mould, and heavy infestation kills the plants.

The geographical distribution of the Coccinellids and the technique used in rearing them are discussed, and detailed descriptions are given of all stages. In the laboratory, at a mean temperature of 26·8°C. [80·24°F.] and a mean humidity of 86·03 per cent., the life-cycle from egg to adult required a little over three weeks. The incubation period of *S. grandis* averaged 4 days, the larval 13·52, and the pupal 4·23. The corresponding figures in the case of *A. dilatata* were 4, 13·16 and 5·16. The duration of the different larval instars of both species is shown in tables. Both adults and larvae consumed an enormous number of Aphids. An adult of *A. dilatata* destroyed on an average 87·8 in an hour, a first-instar larva about 100 a day and older ones from 400 to 500 a day. Oviposition takes place several days after pairing. The eggs of *S. grandis* are usually laid on either surface of bamboo leaves 2–4 mm. apart in batches of about 34. Those of *A. dilatata* are frequently laid on thread-like branches of bamboo or on the stems of wild grasses, usually in two parallel rows and close to one another, the number in each batch averaging 28. Pupation occurs on the leaves, to which the pupae are attached by means of a viscous substance. The pupa is the weakest stage in the life-cycle. Larvae about to pupate are occasionally attacked by Hymenopterous parasites, and 42 examples of an unidentified Chalcidoid, a description of which is given, emerged from a larva of *A. dilatata* collected in the field. The eggs are protected from natural enemies by rings of a colourless sticky substance secreted by the female about 2–4 mm. from the eggs, the larvae by spine-like tubercles on the back and the adults by a bitter fluid of repellent odour that they emit when seized.

As both species were easy to rear, their artificial dissemination might reduce the injury to bamboo by the Aphids.

Wang (Chung-Ni). **An Experiment with the various Heights and Intensity of Light for trapping Insects particularly for Rice Borer Moths and Leaf Hoppers.** [*In Chinese.*]—*Yearb. Bur. Ent. Hangchow* no. 2 (1932) pp. 251–260, 7 figs., 4 graphs. Hangchow, August 1933. (With a Summary in English.) [Recd. January 1934.]

The height at which a lantern was suspended had very little effect on the numbers of moths trapped at it, though the best results were obtained at 7 ft. The attraction to light of Jassid and Fulgoroid rice pests, however, increased the higher the lantern was placed (between

4 and 8 ft.). The number of insects attracted to electric light and the percentage of females of the rice borer moth [*Chilo simplex*, Butl.] were directly proportionate to its intensity (15 to 100 watts).

CHEN (Fong-Ge). **Experiments for the Control of Mulberry White Caterpillar** (*Rondotia menciana* **Moore**) **with Insecticides.** [*In Chinese.*]—*Yearb. Bur. Ent. Hangchow* no. 2 (1932) pp. 261–266, 1 graph, 5 refs. Hangchow, August 1933. (With a Summary in English.) [Recd. January 1934.]

Of a number of insecticides tested againt the larvae of *Rondotia menciana*, Moore, which is a serious pest of mulberry in China, the best results were obtained from a pyrethrum soap solution, which was followed in effectiveness by rhododendron soap solution and croton-oil emulsion. It is possible, however, that these insecticides may be injurious to the foliage and to silkworms [*Bombyx mori*, L.] subsequently feeding on it. The croton-oil emulsion cost 3–4 times as much as either of the other materials.

CHEN (Kan-Fan), TSIANG (Nai-Pin) & SUNG (Tsa-Lien.) **An Experiment with Straw Binding around the Trunk and large Branches of Mulberry Trees for trapping Insects (1932–1933).** [*In Chinese.*]—*Yearb. Bur. Ent. Hangchow* no. 2 (1932) pp. 267–271. Hangchow, August 1933. (With an Abstract in English.) [Recd. January 1934.]

Straw bands on mulberry trees in China caught a very large proportion of hibernating larvae and pupae of injurious Lepidoptera, especially *Margaronia pyloalis*, Wlk., *Hemerophila atrilineata*, Butl., and *Arctornis chrysorrhoea* (*Porthesia similis*) var. *xanthocampa*, Dyar. The bands should be made of 4–5 layers of straws (bent in half so as to reduce their length to 12–16 ins.) tied vertically to the trunks and large branches of the trees. They should be applied early in October and removed in February or March.

HSU (Kuo-Tung). **A Compilation and Deduction of the Insect Pests recorded in the History of all the Districts at Chekiang.** [*In Chinese.*]—*Yearb. Bur. Ent. Hangchow* no. 2 (1932) pp. 332–363. Hangchow, August 1933. (With an Abstract in English.) [Recd. January 1934.]

Information has been compiled from the Chinese literature from the earliest times on the distribution, period of injurious activity, factors affecting the outbreaks, etc., of a number of pests recorded from Chekiang. The more important insect pests of rice are : *Chilo simplex*, Butl., *Schoenobius bipunctifer*, Wlk. (*incertellus*, Wlk.) and *Sesamia inferens*, Wlk., all of which cause serious damage in western Chekiang and the Shaohing district, usually appearing in autumn ; the Delphacids, *Sogata* (*Liburnia*) *furcifera*, Horv., *Delphacodes* (*L.*) *albovittata*, Mats., and *Nilaparvata* (*L.*) *oryzae*, Mats., and the Meenoplid, *Nisia atrovenosa*, Leth., which are present in August and September chiefly in western Chekiang ; the Hesperiids, *Parnara guttata*, Brem., and *P. pellucida*, Murr., and the Pyralids, *Bradina admixtalis*, Wlk., and *Cnaphalocrocis medinalis*, Gn., all of which attack rice chiefly in

July–August ; and *Hispa armigera*, Ol., which is abundant in the Wenchow district in July and August.

Euproctis bipunctapex, Hmps., attacks Chinese tallow trees [*Sapium sebiferum*] in June–July, and larvae of *Dendrolimus* sp. occur on pines in May–August, chiefly in south-western Chekiang. The chief outbreaks of *Locusta migratoria*, L., which either breeds locally along the banks of the lower Chekiang River and Taihu Lake or migrates from Kiangsu, occur in July.

NIXON (G. E. J.). **New Javanese Species of *Hadronotus* (Hym., Proct. Scelioninae).**—*Stylops* **3** pt. 1 pp. 1–5, 4 figs. London, 15th January 1934.

Descriptions with a key are given of four new species of Scelionid egg-parasites, *Hadronotus dasyni* from *Dasynus piperis*, China [*cf. R.A.E.*, A **22** 60] and *H. oophagus* from a Coreid in Banka, and *H. homoeoceri* from *Homoeocerus marginellus*, H.-S., and *H. leptocorisae* from *Leptocorisa acuta*, Thnb., in Java.

MUESEBECK (C. F. W.). **Seven new Species of reared Braconidae (Hymenoptera).**—*Proc. ent. Soc. Wash.* **35** no. 9 pp. 193–200, 2 refs. Washington, D.C., December 1933.

The new species described include *Apanteles impunctatus* from *Diatraea saccharalis*, F., in Louisiana, *A. sorghiellae*, from *Celama sorghiella*, Riley, in Missouri and Texas, *A. bushnelli* from pine tips infested with *Rhyacionia frustrana bushnelli*, Busck, in Nebraska, and *Microbracon phyllocnistidis* from *Phyllocnistis citrella*, Stn., in Java.

LIST (G. M.) & DANIELS (L. B.). **A promising Control for Psyllid Yellows of Potatoes.**—*Science* **79** no. 2039 p. 79. New York, 26th January 1934.

In 1932, Psyllid yellows, caused by the feeding of *Paratrioza cockerelli*, Sulč [*cf. R.A.E.*, A **21** 454], reduced the potato crop in Colorado by as much as 8 million bushels, with equally heavy loss in other States. In preliminary experiments, lime-sulphur sprays gave good results.

SMITH (F. F.). **The Cyclamen Mite and the Broad Mite and their Control.**—*Circ. U.S. Dep. Agric.* no. 301, 13 pp., 7 figs., 2 refs. Washington, D.C., November 1933.

In the United States, *Tarsonemus pallidus*, Banks (cyclamen mite) and *T. latus*, Banks (broad mite), which is possibly synonymous with *T. translucens*, Green, may cause considerable damage to greenhouse and other plants, a list of 58 of which is given, 49 of these being attacked by *T. latus* and 25 by *T. pallidus*. The wide distribution of *T. latus* indicates that, though it was first observed as a greenhouse pest in 1928 [*R.A.E.*, A **17** 607], it has probably been present for many years and has been confused with *T. pallidus*. Comparisons are made of the egg, larva and adult female of the two species and of the typical injury caused by each, which is also discussed with particular reference to *Cyclamen* [**5** 507]. The mites cause equally severe damage, but when both occur in association, *T. latus*, which injures the leaves and buds (distorting and stunting the growth), predominates.

At 70–80°F., it completes a generation in 4–5 days, which is less than half the time required by *T. pallidus* ; at this temperature, *T. latus* may deposit 7 eggs daily and *T. pallidus* 1–3. Investigations carried out over two years have shown that breeding is continuous throughout the year, but that *T. latus* is most abundant from spring to early autumn and *T. pallidus* from autumn until early spring.

T. pallidus appears to be more resistant to dusts and fumigants than *T. latus* and is also protected by its more frequent occurrence in plant crevices and by the leaf-curl it produces ; it is possible that some records of successful control of the former may really refer to the latter. The larvae and adults of *T. latus* may be killed by sulphur dust applied several times to the lower surface of the leaves after watering, or by diatomaceous earth, which, however, is less effective against the larvae that hatch after it is applied. Good results may be obtained with 3 fumigations at intervals of 4 days with either ⅜–1 oz. calcium cyanide to 1,000 cu. ft. space (a dosage injurious to some plants) or 2–7 oz. naphthalene to 1,000 cu. ft. space, the latter being applied over a period of 16 hours at 75–80°F. and at high humidity. As many as 7 applications of naphthalene have not controlled *T. pallidus* on *Cyclamen* or *Delphinium*, though in one test successful results were obtained on *Begonia*, on which the mites are more exposed.

Experiments in treating stock on which *T. pallidus* has become established showed that both mites are killed by exposure to 110°F. for 30 mins. in a specially constructed vapour-heat machine [*cf.* **20** 429] or by immersion for 15 mins. in water at this temperature [*cf.* **21** 279]. The potted plants should be placed on trays having slat or mesh bottoms in a covered tank in which the temperature of the water is kept even throughout by agitation, and should then be allowed to drain for 24–48 hours in the shade to avoid injury to the foliage. Treatment resulted in the death of mites in the crown of *Delphinium*, *Gerbera* or strawberry when the soil had been removed from the roots and the plants placed loosely on the trays ; it was not so successful when the plants were treated in bundles. Plants infested between the leaf-bases in the crown below the soil surface in 4-inch or larger pots require treatment for 25 mins. Re-infestation must be avoided by isolating the treated stock and by judicious handling. The chief food-plants of *T. pallidus* are injured very slightly or not at all by this treatment.

FLANDERS (S. E.). **Heat Production and Limitation of Densities in *Sitotroga* Populations.**—*Ann. ent. Soc. Amer.* **26** no. 4 pp. 529–535, 17 refs. Columbus, Ohio, December 1933.

In experiments to determine whether the rise of temperature in stored grain due to the presence of insects [*cf. R.A.E.*, A **13** 84 ; **20** 645] could be used as an index of the amount of infestation, approximately 9,100 grains of maize, previously fumigated with carbon bisulphide, were placed in each of 12 one-gallon jars. These were stocked at 29°C. [84·2°F.] with newly hatched larvae of *Sitotroga cerealella*, Ol., at rates of from 1 to 4 larvae per grain, 2 jars being kept as controls. The individual life-cycle was about 40 days, and the experiment was complete in 60. In jars kept at 29°C., the " heat of infestation " was first apparent after 6 days ; in those kept at 20°C. [68°F.], it did not appear after 13 days, but when they were exposed to 29°C. it became apparent the next day. The sum of daily temperature readings after 47 days at 29°C. was 96°C. [172·8°F.] higher in a jar

originally stocked with 2·5 larvae per grain than in the control ; this was found to correspond to an actual infestation of 40 per cent. In jars more lightly or more heavily stocked, the infestation and the heat generated were less. The heat increased directly with the growth of the larvae, until most of them had spun their cocoons, and then decreased until all the adults had emerged, when the temperature of the infested jars fell to that of the controls. The life-cycle in denser populations was shortened by the amount of heat generated.

The " heat of infestation " curve is largely independent of environmental temperature fluctuations between 20 and 30°C. [68–86°F.], especially in the later stages of development, but in small units such as those used in the experiment, it is less at 34°C. [93·2°F.] and not apparent at 8·5°C. [47·3°F.]. With more accurate means of measurement, a closer correlation between the amount of infestation and the heat generated could probably be found.

In the jars with two or more larvae per grain, actual infestation was heaviest near the top, probably because the young larvae moved downwards, became crowded at the bottom and killed one another. As many as 99 per cent. of the infested grains were only attacked by one larva out of a possible 3 or 4. The percentage of larvae that survived to reach the adult stage was in inverse ratio to the initial population.

FULTON (B. B.). **Notes on** *Habrocytus cerealellae*, **Parasite of the Angoumois Grain Moth.**—*Ann. ent. Soc. Amer.* **26** no. 4 pp. 536–553, 1 fig., 1 pl., 4 refs. Columbus, Ohio, December 1933.

An account is given of detailed investigations carried out in North Carolina in 1932 on the bionomics of *Habrocytus cerealellae*, Ashm., a parasite of *Sitotroga cerealella*, Ol. [*cf. R.A.E.*, A **20** 463]. The mechanism of oviposition, the formation of feeding tubes, and the technique used for rearing the parasite under observation are described.

The following figures show data obtained at 25°C. [77°F.] and (in brackets) at 30°C. [86°F.] : life-cycle from egg to adult, 11–14 days (10–11) for males and 12–15 (10–13) for females ; incubation period, about 1½ days (about 1 day) ; active larval stage, 4–5 days (4–4½) ; pre-pupal stage, about 1 day (1 or less) ; pupal period, 5–6 days (4–5) for males and 6–7 (5–6) for females. The adults remained in the cells or larval tunnels in the grains generally less than a day, and emerged by cutting small circular exit holes.

When confined with sugar and water, 3 males lived 19–30 days, and 5 females from 27 to 78 days, the last figure including 7 days' confinement in a refrigerator, laying from 97 to 676 eggs. The pre-oviposition period was usually 2–3 days, but the most prolific female did not oviposit for 6 days after leaving the grain. Of 164 adults reared from 5 paired females, only 18 per cent. were males, but unmated females produce males only.

The reproductive capacity of the parasite is nearly three times that of the host. The former is handicapped, however, by the fact that it cannot parasitise the host larvae until the cavity in the grain has extended to the seed coat. Several eggs were sometimes laid in one grain, but never more than one adult parasite emerged.

A female of this Pteromalid was reared in average time from an egg laid on a larva of the rice weevil [*Calandra oryzae*, L.].

MacLeod (G. F.). **Effects of Ultra Violet Radiations on the Bean Weevil,** *Bruchus obtectus* **Say.**—*Ann. ent. Soc. Amer.* **26** no. 4 pp. 603–615, 4 graphs, 1 pl., 4 refs. Columbus, Ohio, December 1933.

The following is the author's summary: Eggs and first-instar larvae of *Bruchus obtectus*, Say, were killed by exposure to wave lengths of light shorter than 3,126 Å from a quartz-mercury arc. Adults exposed to these same rays exhibited no marked effects, but eggs from these forms were largely sterile. Sublethal dosages produced forms which were defective in their metabolic processes, as was evidenced by the excessive amount of food consumed and failure to build a correspondingly greater body weight.

Abnormalities of external structures were apparent in forms from both irradiated eggs and adults. Shortened elytra, or swollen abdomens, an abnormality accentuated in the third and fourth generations, were very common in progeny of all irradiated forms. Larvae developing as progeny of irradiated adults sometimes had a prolonged pupal period with the resulting forms becoming mixtures of larvae, pupae and adults.

Brierley (P.) & McWhorter (F. P.). **A Mosaic Disease of Bulbous Iris.** (**Abstract.**)—*Phytopathology* **24** no. 1 p. 4. Lancaster, Pa, January 1934.

The planting on a commercial scale of Spanish and Dutch bulbous iris in the United States has been hindered by a destructive mosaic disease introduced on the stocks imported from Europe. Infected plants are dwarfed and develop yellow-striped or mottled leaves and flower-sheaths and blotched flowers. In investigations on its transmission by Aphids carried out in 1929–33, positive results were obtained in 50 per cent. of cage tests with *Myzus persicae*, Sulz., and 31 per cent. with *Macrosiphum* (*Illinoia*) *solanifolii*, Ashm., but only negative results with *M.* (*Myzus*) *pelargonii*, Kalt., *Myzus circumflexus*, Buckt., *Anuraphis tulipae*, Boy., and *Rhopalosiphoninus staphyleae*, Koch (*tulipaella*, Theo.). Transfer by Aphids occurred only where the insects migrated naturally from diseased to healthy plants in the cage.

Osborn (H. T.). **Incubation Period of Pea Mosaic in** *Macrosiphum pisi*. (**Abstract.**)—*Phytopathology* **24** no. 1 p. 15. Lancaster, Pa, January 1934.

In experiments on the transmission of pea mosaic by *Macrosiphum onobrychis*, Boy. (*pisi*, Kalt.) [*cf. R.A.E.*, A, **21** 168] to broad beans (which were used in most experiments), peas and sweet peas [*Lathyrus odoratus*], Aphids that had fed on infected plants remained infective throughout their active life. By exposing a succession of healthy plants to colonies that had fed for a short time on diseased plants, an incubation or non-infective period was shown to exist, varying from 12 to 28 hours. Mechanical transmission to broad beans was difficult.

DOOLITTLE (S. P.) & WELLMAN (F. L.). *Commelina nudiflora*, **a Monocotyledonous Host of a Celery Mosaic in Florida.**—*Phytopathology* **24** no. 1 pp. 48–61, 3 figs., 10 refs. Lancaster, Pa, January 1934.

During 1928–32, a mosaic disease of celery (*Apium graveolens*) that differs from those previously described caused serious losses in Florida; in one district in the spring of 1928 these amounted to 10–80 per cent. over an area of 250 acres, estimated at £10,000, and in 1929, when some plantings were never harvested, they were estimated at £15,000. It has also been found in other parts of the United States.

Experimentally, the disease was transmitted by mechanical inoculation and also by *Aphis gossypii*, Glov., the latter being responsible for its rapid dissemination in the field. It was also found possible by either method to transmit celery mosaic to cucumber and cucumber mosaic to celery. *A. gossypii* also transmitted celery mosaic to tomato, the cultivated ground cherry (*Physalis pubescens*) and tobacco. The virus did not appear to persist in the soil or in the seed, but commonly occurred in *Commelina nudiflora*, and once in *Physalis lagascae*. As the primary infection of celery could be traced directly to infected plants of *Commelina* near the borders of the fields, from which it was transmitted by *A. gossypii*, the eradication of this weed would probably give effective control of the disease [*R.A.E.*, A **20** 681].

FAURE (Jacobus C.). **Some Aspects of Entomological Work in the United States.**—Demy 8vo, 28 pp., 16 refs. Pretoria, Carnegie Corp. Visitor's Grants Comm., December 1933.

This paper includes a review of recent work on grasshoppers in the United States, in which the author enumerates the injurious species and briefly describes their distribution and annual life-cycle. He alludes to the suggested correlation between sun-spot minima and grasshopper abundance [*R.A.E.*, A **21** 50], and considers that climatic conditions are responsible for the building up of the swarms of *Melanoplus mexicanus*, Sauss. [*cf.* **18** 623], of which *M. spretus*, Walsh, is the migratory phase [**21** 472]. Outbreaks of *Camnula pellucida*, Scud., in British Columbia have been found to be connected with over-grazing [**13** 196], and it is suggested that the over-stocking of some areas in the Karroo may encourage the breeding of *Locustana pardalina*, Wlk., in South Africa.

According to unpublished observations by J. R. Parker in Yellowstone Park, *C. pellucida* is most abundant where ground thickly covered with *Carex*, which serves as food, is interspersed with drier patches. The size of these varies with periodic fluctuations in the water supply, and the vegetation on them dries up in August, so that they offer suitable sites for oviposition.

The organisation of control in the United States is briefly described, the standard method being the use of poisoned bait [**20** 410, 412].

SMITH (H. S.) & others. **Efficiency and Economic Effects of Plant Quarantine in California.**—*Bull. Calif. agric. Exp. Sta.* no. 533, 276 pp., 12 pp. refs. Berkeley, Calif., July 1933. [Recd. January 1934.]

This detailed review of the problem of plant quarantine in California deals separately and at length with its biological, economic and

administrative aspects. The biological problems discussed include the factors that might lead to the introduction of a given pest, such as the absence of barriers to its natural spread (a condition that generally makes effective quarantine impracticable) or its association with articles of commerce ; the likelihood of its establishment if introduced in sufficient numbers at the right season ; and the chances, in view of local climatic and agricultural conditions, of its becoming a major pest. The merits of the principal systems of plant quarantine are compared, and the immediate and cumulative results of quarantines and the conditions under which they are financially remunerative are discussed. It is important that a quarantine that has ceased to be effective, or the major usefulness of which has passed, should be promptly rescinded. The permanent establishment of a pest may be prevented by an eradication campaign even where quarantine has failed to prevent its incipient establishment.

A brief history of plant quarantine in California is given, together with particulars of administration, and the quarantines in force are analysed under the individual insect pests and diseases concerned.

Smith (L. M.). **The Emergence of Pear Thrips in the Healdsburg Area of California in 1932.**—*Bull. Calif. agric. Exp. Sta.* no. 562, 16 pp., 3 figs., 1 ref. Berkeley, Calif., November 1933.

In observations in 1932 on *Taeniothrips inconsequens*, Uzel, in a district to the north of San Francisco, where the unsatisfactory control of this thrips on prunes obtained during the past few years has been attributed to an abnormally long period of emergence, 45 traps were placed over the cover crop, or on soil from which it had been mown, near the base of trees in representative orchards that had been heavily infested in the spring of 1931. Each trap consisted of a four-sided pyramidal frame (3 ft. sq. at the base) covered with fine-mesh muslin and having at the apex a small glass vial with a truncated cellophane cone fitted inside it to trap the thrips. Three coats of white paint were applied to the inside of the muslin. Every other day the vial was renewed and the position of the trap altered, so that it should not affect the soil temperature underneath.

From 19th February to 27th March, an average of 377·8 thrips emerged per trap, representing an average of 9·9 daily per sq. yd. The maximum number caught in 2 days was 1,234 per sq. yd., and significant emergence (arbitrarily fixed at 5 or more thrips per day) extended from 23rd February to 21st March, which is not appreciably longer than in the San José area further south [*R.A.E.*, A **3** 462]. In 3 traps left stationary throughout the experiment, an average of 42·6 thrips emerged per sq. yd. per day. The rate of emergence was less during a short period of cold weather. The number of adults that remained on the cover crop instead of flying up to the vial (as estimated by comparing the numbers caught over freshly cleared soil) reached a maximum of 33·2 per sq. yd. on 2nd March, after which it decreased ; thus disking after this date would have no appreciable affect on infestation. As many as two irrigations in August–September sometimes failed to reduce appreciably the numbers of thrips that emerged in the following spring. More than 20 times as many emerged from heavy soils as from light ones on 9th March, and about 6 times as many over the whole period. Emergence in

orchards sprayed or dusted with nicotine [*cf.* **16** 118] during the preceding spring showed that 3–6 applications had failed to reduce the population to a negligible number.

NEL (R. G.). **A Comparison of *Aonidiella aurantii* and *Aonidiella citrina*, including a Study of the Internal Anatomy of the Latter.**—*Hilgardia* **7** no. 11 pp. 417–466, 12 figs., 31 refs. Berkeley, Calif., April 1933. [Recd. January 1934.]

The author discusses the status of the genus *Aonidiella*, of which the type is *Aspidiotus aurantii*, Mask., a species that has commonly been referred to the genus *Chrysomphalus*, and concludes, after examining *Aspidiotus hederae*, Vallot, and *C. aonidum*, L., the type species of the respective genera, and considering the original and subsequent descriptions, that *Aonidiella* is a valid genus. A detailed comparison of *A.* (*Aspidiotus*) *citrina*, Coq. (yellow scale), with *A. aurantii*, of which it has generally been considered a variety, has led the author to accord it specific rank. The formation of the scales over the larvae and adults is discussed, and the metamorphosis of the males, the external morphology of both sexes of the two species and the internal anatomy of the adults of *A. citrina* are described in detail.

A. aurantii, which is found on all parts of *Citrus* trees, is distributed practically throughout the subtropical and tropical regions, but *A. citrina*, which concentrates on the leaves and fruit and is therefore a less serious pest, has only been recorded from Japan, Texas and California. In California, *A. aurantii* is most abundant in the south, whereas *A. citrina* prefers the drier and warmer inland valleys in the central part. Observations on the life-history on young seedlings and trees of orange are described. About 1–2 days after their deposition, the larvae migrate (usually over a period of about 6 hours) to a suitable feeding place, preferably beside the mid-rib or other prominent veins of the leaves. Mortality was highest during this stage, probably owing to the inability of the larvae to pierce the epidermis, to form a protective covering or, having once fallen off, to regain a leaf. At 82°F., young larvae emerged continuously over a period of 60 days. The life-cycle from emergence of the larvae to the beginning of reproduction averaged 61 days for *A. aurantii* and 65 for *A. citrina*. Experiments showed that neither parthenogenesis nor cross-breeding occurs.

INGLES (L. G.). **The Succession of Insects in Tree Trunks as shown by the Collections from the various Stages of Decay.**—*J. Ent. Zool.* **25** no. 4 pp. 57–59. Claremont, Calif., December 1933.

In a study of the insect fauna of tree-trunks in California in 1929, five stages of decay were distinguished. In the first, when the trees usually contained much fermenting sap and retained a few live leaves, insects were found chiefly under the bark. In the second, the trees only retained dead leaves, and the bark had been loosened by the borers, which could still be found in their tunnels. In the third, when the wood was well seasoned and the trees generally stripped of bark but still standing, they were often infested by Buprestids and termites. In the fourth, the trunk was honeycombed by wood-borers and termites, saturated with moisture and permeated with mycelium fungus. In the fifth, it was crumbling and dry and could be readily pulled apart

with the hands. The insects found inhabiting various tree-trunks examined are listed, and it is shown that the great majority occur only in one stage and with few exceptions in only one kind of tree.

HALL (R. C.). **Post-logging Decadence in northern Hardwoods.**—*Bull. Sch. For. Univ. Mich.* no. 3, 66 pp., 27 figs., 2 pp. refs. Ann Arbor, Mich., November 1933.

Investigations in 1927–30 in Michigan, Wisconsin, Minnesota and New Hampshire showed that the deterioration prevalent among hardwood trees, particularly birch, left after logging was largely due to various factors depending on environment. *Agrilus anxius*, Gory (bronze birch-borer), which has been an important pest of ornamental birches for 30 years, was only found in association with some other factor causing decadence [*cf. R.A.E.*, A **15** 248]. Its oviposition, hatching and emergence followed Hopkins' bioclimatic law [**8** 87, 278], but in general the adults emerge about 1st July, and the females begin to oviposit within 2 weeks. They lay from 1 to 8 eggs, with an average of 3, in crevices or breaks in the outer bark. The larvae tunnel in the cambium, only burrowing into the wood to moult. They hibernate in the cambium during the first winter and spend the second winter as prepupae in the pupal cells. These are usually found in the wood, but in thick-barked poplars they are formed in the bark. Pupation occurs in early spring. The leaves at the top of an infested tree are first seen to be smaller than those lower down ; in the second season the topmost twigs may die, and in the third the whole crown, or even the whole tree. These symptoms are not, however, conclusive evidence of attack by this Buprestid.

Other insects attacking birch, besides defoliators [**21** 416, 454, 476], were Scolytids and *Lymexylon* sp. (birch timberworm], which were generally found in decadent trees.

HATCH (M. H.). *Ptinus tectus* **Boieldieu in America.**—*Bull. Brooklyn ent. Soc.* **28** no. 5 pp. 200–202. Brooklyn, N.Y., December 1933.

The distribution, life-cycle and systematic position of *Ptinus tectus*, Boield., a pest of dried food-stuffs, etc., are briefly discussed from the literature. It was first recorded from America in 1928 by W. J. Brown, who described it from British Columbia as new under the name *P. ocellus*. The author found a single individual in 1930 and large numbers in a warehouse in 1932 in Seattle, Washington.

[PEIRSON (H. B.).] **Entomology.**—*19th bienn. Rep. For. Comm. Maine 1931–1932*, pp. 59–73. [Augusta, Maine 1933.]

Insect pests of forests injurious in Maine during 1931 and 1932, some of which have already been noticed [*R.A.E.*, A **20** 225, 282, 300 ; **21** 228, 316, 476], included *Bucculatrix canadensisella*, Chamb., which was abundant on birch over a large area in the north ; *Malacosoma disstria*, Hb., on poplar ; *Dendroctonus piceaperda*, Hopk., on spruce ; *Chermes* (*Dreyfusia*) *piceae*, Ratz. [*cf.* **21** 283], an outbreak of which occurred in 1931 on fir [*Abies*] ; and *Coleophora laricella*, Hb., which killed 25 per cent. of the trees in some stands, and *Lygaeonematus erichsoni*, Htg., both on larch. *Pissodes strobi*, Peck, has become markedly more abundant since the increase of the area under

white pine [*Pinus strobus*], attacking other species as well that have hitherto been considered relatively immune [*cf.* **20** 40]. Bands of adhesive afforded some control, but only if placed just below the terminal buds. Observations showed that most of the weevils fly direct to the tops of the trees. Although they fly chiefly at mid-day, they are strongly attracted to light at night.

A series of experiments in the control of white grubs [*Lachnosterna*], which are extremely destructive to forest nursery stock, showed that very good results may be obtained by soil treatment with crude arsenic, applied at the rate of 200 lb. per acre in the first year (or 250 lb. if the grubs are very numerous), and at 100–150 lb. in following years, without any danger to the trees (pines) ; lead arsenate used at rates of 200–250 lb. per acre gave fair control.

Dusting with lime-sulphur gave promising results against beetles boring in pine, fir and spruce logs left in the open with the bark on throughout spring and summer ; in one instance, infestation by round-headed [Longicorn] borers was reduced by 73 per cent. and by flat-headed [Buprestid] borers by 59 per cent.

Of the pests of shade trees, *Stilpnotia salicis*, L., was abundant in central Maine, and *Lecanium corni*, Bch., occurred locally on elms. Severe outbreaks of *Rhynchaenus* (*Orchestes*) *rufipes*, Lec. (willow snout-beetle) occurred in several districts. The larvae mine in the leaves, and the adults chew holes in them. This weevil has proved to be very resistant to sprays [*cf.* **10** 114] and difficult to control.

Epilachna corrupta, Muls., on beans, and *Popillia japonica*, Newm., were reported from the State for the first time in 1932, and *Gracilaria syringella*, F. (lilac leat-miner), a European insect, was found at Bar Harbor.

Squire (F. A.). **Insect Pests of Rice and Padi.**—*Rice Bull. Brit. Guiana Dep. Agric.* no. 1 pp. 51–57, 2 refs. Georgetown, 1933.

The fumigation of stored rice is always difficult, owing to its impenetrability. In British Guiana it is complicated by the use as storehouses of loosely constructed wooden buildings, which only permit treatment on a small scale with the non-inflammable mixture of ethylene dichloride and carbon tetrachloride. Moreover, the climatic conditions enable insect pests to breed throughout the year. *Calandra oryzae*, L., has 7–12 generations annually ; the rate is somewhat reduced during the two dry seasons (though it is possible for at least two generations to develop during the longer one, which lasts 4 months), and rice stored at these periods is less damaged than in the wet season. In a study of the relation between the development of this weevil, the relative humidity and the hardness of the rice, the pressure required to crack a grain, as shown by an apparatus here described, ranged from 7·4 lb. after 5 days' storage at 90 per cent. relative humidity to 24·7 lb. at 50 per cent. At the latter humidity, only 3 eggs were laid, indicating that the grain was too hard for the ovipositing females, and none of them hatched. At 77 or 82 per cent. humidity, the life-cycle was at least 45 days ; at 90 per cent., it was 30–45. The use of *Melia azedarach* or peppers [? *Capsicum*] as a repellent proved valueless, and weevils were found inside the fruits of the latter, apparently feeding on the seeds. Naphthalene affords protection, but only for small quantities of grain during a short period and in an air-tight space. Sodium fluosilicate stirred into the bags with the rice gave promising results, causing 83·3 and 58·3 per cent.

mortality in 2 samplings at the minimum rate of ¼ lb. per bag and 95·7 and 100 per cent. at the maximum rate of 5 lb., as compared with an average natural mortality of 20·8 per cent. over the six months period.

Growing rice is attacked by *Diatraea*, the only species yet recorded on it in the Colony being *D. saccharalis*, F. Though ploughing the stubble and flooding after reaping [*R.A.E.*, A **20** 707] may reduce its numbers, it is doubtful whether these measures materially affect infestation in view of the wide distribution of alternative food-plants. The larvae of *Scirpophaga albinella*, Cram., all stages of which are briefly described, live in the stems of rice a little above the water level and pupate under small holes covered by a silken membrane through which the adults emerge when the grain is formed. The eggs are usually laid on young rice shortly after transplanting. A light-trap caught 407 males and 166 females, 136 of which were gravid, in 21 nights; the results are not considered to justify the expense. The eggs were attacked by a Hymenopterous parasite, which completed its life-cycle in 13 days, and the larvae by a Braconid, *Hecabolus* sp., 30 of which emerged from one pupa. It is probably owing to parasites that so little damage is usually caused during the periodic outbreaks of this Pyralid [*loc. cit.*], which usually occur at the beginning of the rainy seasons, about May and December.

Pemberton (C. E.). **Entomology.**—*Rep. Comm. Exp. Sta. Hawaii. Sug. Pl. Ass. 1933* pp. 14–19. Honolulu, 1933.

Notes are given on the situation in Hawaii in 1933 as regards the control of the major pests of sugar-cane by their natural enemies, which in general appears very satisfactory. *Anomala orientalis*, Waterh., is still numerous in one plantation [*cf. R.A.E.*, A **21** 492], though heavy mortality resulted from ploughing the land and leaving it fallow. Treatment with white arsenic protected certain soils from infestation for over a year. Thousands of beetles, mostly females, many of which had not completed oviposition, were collected from the flowers of *Ageratum houstonianum*, which was extensively grown as a trap-plant along roads, ditches, etc. Arsenical dusts impregnated with oil [**21** 347] for use against *Cirphis unipuncta*, Haw., and *Spodoptera mauritia*, Boisd., should not be stored for more than a few months, as they are liable to deteriorate; in areas drenched with heavy rain, they may be replaced by poison baits compacted with casein [*cf.* **22** 25]. The introduced toad, *Bufo marinus* [**21** 493], which in confinement consumes a great variety of insects, has multiplied and spread and has been distributed in two further localities, one including fields infested with *Anomala*. A total of 2,352 parasites [*Tiphia lucida*, Ashm.] emerged during the summer from cocoons obtained from the Philippines in 1932 [**21** 493] and were liberated against *Adoretus sinicus*, Burm., in 4 sites in Oahu, but no recoveries have yet been made. The parasite [*Pseudoccobius terryi*, Fullaway] of the grey sugar-cane mealybug [*Pseudococcus boninsis*, Kuw.] was successfully exported to Louisiana [**20** 697], whence it has been sent to Porto Rico. The pineapple mealybug [*P. brevipes*, Ckll.] has been observed, sometimes in large numbers, on the roots and underground stalk-tissues of sugar-cane in many localities. It is usually present on ratoon stools, and is abundant when these escape flooding by being placed too high in the row, or during a drought or in abandoned, unirrigated cane. Its effect on the cane is being investigated.

Summerville (W. A. T.). **Maori Mite Control.**—*Qd agric. J.* **40** pt. 5 pp. 379–381 ; also as *Adv. Leafl. Dep. Agric. Stk Qd* no. 6, 3 pp. Brisbane, 1st November 1933.

The Maori mite [*Phyllocoptes oleivorus*, Ashm.] has been a pest of *Citrus* in Queensland for some years. The eggs are laid in sheltered positions on the leaves and fruit, usually in clusters. The adults move freely, but do not migrate far from the site of hatching, so that a colony may be formed gradually on one part of a fruit. The mites moult twice before reaching maturity, and the cast skins remaining on the plant are often an index of infestation. The injury is mostly confined to the fruits, but when these are absent, the leaves are sometimes attacked to a marked extent, especially those of younger trees. The mites feed by piercing the surface cells, causing characteristic marks that vary with the different species of *Citrus* and with the age of the fruit. In the summer months, the life-cycle occupies just over a week. The trees should be sprayed in late November or early December with lime-sulphur (1 : 20–25). If further treatment is needed in January–March, they may be dusted (in late evening or early morning) with flowers of sulphur [*cf. R.A.E.*, A **19** 87] or sprayed with lime-sulphur (1 : 30–35).

Strong (T. H.). **The Brown Cutworm as a Cotton Pest.**—*Qd agric. J.* **40** pt. 5 pp. 396–400 ; also as *Adv. Leafl. Dep. Agric. Stk Qd* no. 4, 6 pp. Brisbane, 1st November 1933.

An outbreak of *Euxoa radians*, Gn., on cotton in the Callide Valley, Queensland, in November 1932 was probably caused by the extensive growth of weeds in open areas following rain in mid-October ; wherever these were not eliminated by cultivation, a large cutworm population developed. Sandy loam soils were the most susceptible [*cf. R.A.E.*, A **19** 298], very little development occurring in clay soils. Observations indicated that few larvae develop in fields of cotton seedlings free from low-growing weeds such as pig-weed [*Portulaca oleracea*]. The infestation seemed to have arisen by migration of larvae from weeds growing either outside the cotton crop or amongst the cotton. Migration from a weedy area to cotton continued from about 12th November until the first week in December, when it was probably reduced by high temperatures. The uniformly low or moderate atmospheric humidity and the favorable temperature of the top two inches of soil (average maximum 96°F.) in November apparently provided optimum conditions for cutworm development. The larvae were adversely affected by the rise of the soil surface temperature towards 110°F.

Control measures [*loc. cit.* and **16** 450] are discussed in some detail. In fallow land adjoining a weedy area, where no furrows containing poisoned bait were made, an infestation occurred on the plant material that had been turned into the soil. The larvae began to attack the adjoining cotton plots, but the invasion was checked by the application of poisoned bait in heaps at the base of the plants in front of the line of advance.

Morgan (W. L.). **The Pumpkin Beetle** *Aulacophora hilaris* **Boisd.**—*Agric. Gaz. N.S.W.* **44** pts. 11–12 pp. 811–815, 915–922, 9 figs., 12 refs. Sydney, November-December 1933.

The Galerucid, *Ceratia* (*Aulacophora*) *hilaris*, Boisd., all stages of which are described, is probably the most serious pest of cucurbits over

a large area in Australia. The adults attack the flowers and foliage, sometimes killing the plants, especially those under a month old. They feed on the lower surface of the cotyledons and on both surfaces of young leaves ; older leaves are at first attacked only from the upper surface, but after the leaf has wilted, feeding becomes general. In northern New South Wales, considerable losses are caused annually, and in outbreak years the whole of the spring crop is destroyed and the second crop (if drought does not prevent re-sowing) may be badly damaged. The beetles also attack the young fruits of pumpkins and squashes and occasionally (in dry seasons) cherries and even figs. Additional food-plants recorded in Australia include potato, sugar-cane, apple, maize, peaches, nectarines, grape vines and beans. Those observed by the author in New South Wales were lucerne, *Eucalyptus*, *Carduus marianus*, blossoms of *Opuntia* sp., and *Cucumis myriocarpus*, which appears to be the favourite wild food-plant.

Life-history data were recorded at Sydney during 1930–32. The adults lived 8–10 months in the laboratory. The females laid an average of 490 eggs and a maximum of 1,721. Some of those emerging in February–March oviposited in autumn and again in spring, but those that emerged in April–June did not begin till spring. Oviposition by overwintered females lasted from late September to early January. The beetle overwintered only in the adult stage. Eggs laid on moist soil hatched in 8–10 days in summer and 11–16 in spring and autumn. Eggs laid in May hatched in 23 days, but the larvae died during the winter. Eggs laid in June–July or on dry soil failed to hatch. The larvae preferred the stems to the roots or leaves of pumpkins ; they entered them at ground level and mined upward for about an inch, completing their growth in from 15 to 54 days. Pupation occurred in the soil 1–6 inches below the surface. The average period of development was 45 days from eggs laid in November–February, and 77 days from those laid in March or October. When the period from egg to adult was 50–53 days, the larval and pupal stages were each approximately 18–20. The beetles fly readily except in wet and windy weather. They generally leave the plants late in the afternoon and may be found swarming round adjacent trees in the evening.

Hydrated lime and tobacco dust (equal parts) proved the best of a number of dusts tested for protecting young plants. On older plants, lead arsenate and Paris green sprays had a slight repellent action, but caused injury and did not give satisfactory control. The beetles do not readily feed on foliage dusted with arsenicals, but may become poisoned by cleaning themselves when the dust has settled on them. Pyrethrum powder and lime (1 : 4) gave a 90 per cent. kill. Extra seed should be sown to allow for the destruction of some of the young plants, and the final thinning should be done when they are beginning to grow runners.

French (C.). **New Records of Plants attacked by Native Insects.**— *Vict. Nat.* **50** no. 12 p. 190. Melbourne, December 1933.

Further notes in this series [*cf. R.A.E.*, A **22** 41] discuss the food-plants of the weevil, *Orthorrhinus cylindrirostris*, F., in Australia. It originally fed on the wood of dead or dying, or occasionally of healthy, native trees, but it is now a pest of *Citrus*, deciduous fruit trees, vines, etc.

DE HAAN (J. T.). **Korte gegevens betreffende de cacao-cultuur.** [Brief Data regarding Cacao Cultivation.]—*Arch. Koffiecult. Ned. Ind.* **7** no. 1 pp. 1–74. Buitenzorg, December 1933.

About a quarter of this paper is devoted to the pests and diseases of cacao in the Netherlands Indies. Notes are given on the bionomics and control of the various insects, most of which have been dealt with previously [*R.A.E.*, A **12** 511]. The others are the Cerambycids, *Xystrocera festiva*, Thoms., and *X. globosa*, Ol., the larvae of which mine in the stems and branches, and the Halticid, *Podagrica* (*Nisotra*) *gemella*, Erichs., a Geometrid, *Hyposidra* sp., the Psychid, *Clania variegata*, Sn., the Flatid, *Lawana candida*, F., the Jassid, *Typhlocyba erythrinae*, Konings., and Aphids, all of which feed on the leaves. A general section on control measures and insecticides is included.

TAKAHASHI (R.). **Observations on the Coccidae of Formosa. Part IV.** —*Rep. Govt Res. Inst. Formosa* no. 63, pp. 1–38, 24 figs. Taihoku, Formosa, January 1934.

This paper, which is one of a series on the Coccids of Formosa [*cf. R.A.E.*, A **21** 198], deals with 28 species, including 12 new ones and 4 new varieties. The more important species from an economic standpoint are : *Eumyrmococcus smithi*, Silv., on the roots of sugar-cane ; *Fiorinia horii*, Kuw., on *Rhododendron sasakii* ; *Parlatoria mytilaspiformis*, Green, on the upper surface of the leaves of tea ; *Diaspis boisduvali*, Sign., on an orchid (*Rhynchostylus retusa*) ; *Poliaspis pini*, Mask., on *Pinus thunbergi* ; and *Pseudischnaspis anassarum*, Ldgr. (*Chrysomphalus bromeliae*, Newst.) on pineapple. The last three species have not previously been recorded from Formosa.

The author states in an introduction that *Parlatoria proteus*, Curt., has recently been found in numbers for the first time on mango, *Phenacoccus hirsutus*, Green, on cotton, and *Pseudococcus lilacinus*, Ckll., on coffee, in southern Formosa.

A list is given of new records of food-plants of Formosan Coccids.

TAKAHASHI (R.). **Aleyrodidae of Formosa. Part III.**—*Rep. Govt Res. Inst. Formosa*, no. 63, pp. 39–71, 22 figs. Taihoku, Formosa, January 1934.

This paper contains descriptions of 24 new Aleurodids found on various plants in Formosa, with brief notes on two species that have not previously been recorded from this Island, including *Aleurocanthus mangiferae*, Quaint. & Baker, which was found on *Lithocarpus uraiana* but not on mango, and a list of new records of food-plants of Formosan Aleurodids.

CHIAROMONTE (A.). **Considerazioni entomologiche sulla coltura delle piante da ombra, da frangivento, ecc. nella Somalia Italiana.** [Entomological Notes on the Cultivation of Shade Trees, Windbreaks, etc., in Italian Somaliland.]—*Agricoltura colon.* **27** no. 12 pp. 584–587. Florence, December 1933.

Trees planted in Italian Somaliland for shade or as windbreaks are all introduced species that have become acclimatised. The insect pests observed are scarce and do little harm. Various trees are attacked by adults of *Anomala* spp. Larvae of *Diacrisia* (*Spilosoma*) *investigatorum*, Karsch, feed on the leaves of *Cassia florida*, and the Bostrychids,

Sinoxylon conigerum, Gerst., and *Enneadesmus forficula*, Fairm., mine the branches and the Lamiid *Titoceres jaspideus*, Serv., the trunk and branches. The Bostrychid, *Apate scoparia*, Lesne, and *Argyroploce peltastica*, Meyr., occur on *Poinciana regia*, and *A. peltastica* and the Tineid, *Aphanoptis halogramma*, Meyr., feed on the tender seeds of *Caesalpinia pulcherrima*. The latter is also the favourite food-plant of *Ferrisiana* (*Ferrisia*) *virgata*, Ckll., which is the only pest of mulberry and *Casuarina*. *Terminalia catappa* is attacked by *Cyrtacanthacris tatarica*, L., and *Retithrips aegyptiacus*, Marchal. The roots of *Eucalyptus* are infested by larvae of *Anomala* spp., and the leaves by the adults of the weevil, *Alcides erroneus*, Thoms.

The natural enemies listed have already been noticed from Italian Somaliland [*R.A.E.*, A **18** 450; **21** 426, 584].

Plagas del campo. Memoria del servicio fitopatológico agrícola. Año 1932. [Pests and Diseases of Agriculture. Memoir of the Phytopathological Agricultural Service, Year 1932.]—Roy 8vo, xii+250 pp., illus. Madrid, Minist. Agric., 1933.

The first section of this report comprises a note on the history of the Spanish plant protection service, a summary of Spanish plant pest legislation in the 19th and 20th centuries, and an account of the organisation of the service. The second consists of short notes on the plant pests and diseases observed in Spain in 1932 by the various phytopathological stations, and the last reviews the present regulations for plant protection.

Nägeli (W.). **Ueber Biologie und Verbreitung der beiden Langwanzen** *Gastrodes abietum* **Bergr. und** *Gastrodes grossipes* **De Geer.** [On the Biology and Distribution of the two Bugs, *G. abietum* and *G. ferrugineus*.]—*Mitt. schweiz. Anst. forstl. Versuchsw.* **18** no. 1 pp. 193–280, 22 figs., 77 refs. Zürich, 1933. (With a Summary in French.)

In the winter of 1930–1931, the Lygaeids, *Gastrodes abietum*, Bergr., and *G. ferrugineus*, L. (*grossipes*, DeG.) increased to an extraordinary extent on spruce in Switzerland [*R.A.E.*, A **19** 697]. An account is given of very detailed investigations on their bionomics, which showed that, though they feed on the needles, they do not cause any appreciable damage.

Sitowski (L.). *Eurytoma ischioxanthus* **Ratzb. jako pasorzyt gatunku** *Coeloides melanotus* **Wesm. wyhodowany z** *Hylesinus fraxini* **Pz.** [*E. ischioxanthos* as a Parasite of *C. melanotus* bred from *H. fraxini*.]—*Roczn. Nauk. Rol.* **30** pp. 383–388, 1 pl., 9 refs. Poznań, 1933. (In Polish and German.)

Large numbers of the Braconid, *Coeloides melanotus*, Wesm., not hitherto recorded from Poland, were obtained from bark of ash infested with the Scolytid, *Hylesinus fraxini*, Panz., in the Pieninen mountains. The chief hyperparasite was *Eurytoma ischioxanthos*, Ratz., with a few examples of *E. flavovaria*, Ratz. *E. ischioxanthos* was also bred from *Coeloides bostrychorum*, Giraud, which, together with small numbers of

Ipocoelius seitneri, Ruschka, parasitised *Ips typographus*, L., and *I. amitinus*, Eich. It is therefore apparently not a primary parasite of Scolytids [*cf. R.A.E.*, A **18** 324 ; **19** 242], but occurs as an ectoparasite within the cocoon of its Braconid host.

ZACHER (F.). **Der Kornkäfer und seine Bekämpfung.** [The Grain Weevil and its Control.]—*Mitt. Ges. Vorratsschutz* **9** no. 6 pp. 63–72, 6 figs. Berlin, November 1933.

A brief account of the bionomics of *Calandra granaria*, L., is given from the literature, with measures for its control in Germany. These include treating all surfaces in granaries with aniline. This oil should be mixed with water (1 : 10), 1 part soft soap being added if desired, and sprayed into all cracks. Great care must be taken to prevent it from touching the skin, the operators must wear respirators and have a half-hour interval in the open air after each hour of work, the warehouse must be fully ventilated while the work is being done in it, and grain must not be stored until a few days have elapsed. For limewashing warehouses, $1\frac{3}{4}$ pints of aniline added to a pail of lime-wash has given excellent results, but the walls must be thoroughly dry before grain is allowed to come into contact with them. In laboratory tests, the weevils were killed by vegetable oils, the best being those that dry quickly, such as linseed oil.

KOJIMA (Toshibumi). **Studien zur Oekologie des Kiefernspinners *Dendrolimus pini* L. (Der Einfluss von Temperatur und Luftfeuchtigkeit auf Sterblichkeit und Entwicklungsdauer.)** [Studies relating to the Ecology of the Pine Lasiocampid. (The Influence of Temperature and Air Humidity on Mortality and Duration of Development.)]—*Z. angew. Ent.* **20** no. 3 pp. 329–353, 11 figs., 31 refs. Berlin, December 1933.

In laboratory studies on *Dendrolimus pini*, L., with material obtained from pine in Brandenburg, the adults emerged between 29th May and 14th August, and mating sometimes began on the night of emergence. Adult life averaged 9·5 days, and the period after pairing 7·8. Oviposition began immediately after mating, the average total number of eggs laid being 230.

The zone of lowest egg-mortality (5 per cent. or less) lay between 14 and 31°C. [57·2–87·8°F.] and 40 and 98 per cent. relative humidity. The optima [*cf. R.A.E.*, A **21** 378] were respectively 24°C. [75·2°F.] and 80–85 per cent. humidity. The larva was particularly sensitive to extremes of temperature and humidity at the moment of hatching. The zones of lowest (5 per cent.) mortality for the larvae, in the first and second instars respectively, were temperatures of 18–26·5°C. [64·4–79·7°F.] and 19·5–32°C. [67·1–89·6°F.], and humidities of 55–100 and 58–100 per cent., the vital optima being 23·5°C. [74·2°F.] and 27°C. [80·6°F.], and 75–90 per cent. humidity. For the few third-instar larvae available, temperatures over 36°C. [96·8°F.] were lethal. The pupae were comparatively resistant ; the adults developed and emerged between 13 and 29·5°C. [55·4–85·1°F.] and 17 and 100 per cent. humidity.

The average incubation period was scarcely affected by humidity, but it varied from 8·2 days at 30·5°C. [86·9°F.] to 48·3 at 11·5°C. [52·7°F.]. For the first and second larval instars (at 100 per cent.

humidity) and the pupae, the respective thresholds of development were 8, 7 and 9°C. [46·4, 44·6 and 48·2°F.] and the thermal constants 90, 115 and 315 day-degrees C. [162, 207 and 567 F.]. Larval development was slower at lower humidities, but the pupal period did not appreciably vary.

First-instar larvae withstood starvation longest (25 days) at 0·5°C. [32·9°F.] and 100 per cent. humidity. Second-instar larvae were less resistant.

Mithat Ali. **Experimentelle Untersuchungen über den Einfluss von Temperatur und Luftfeuchtigkeit auf die Entwicklung des Schwammspinners, *Porthetria dispar* L.** [Experimental Investigations on the Influence of Temperature and Air Humidity on the Development of the Gipsy Moth.]—*Z. angew. Ent.* **20** no. 3 pp. 354–381, 12 figs., 15 refs. Berlin, December 1933.

This paper deals with the technique and results of preliminary experiments with *Porthetria dispar*, L., reared on oak from eggs collected in winter near Düsseldorf, Rhineland.

The following is taken almost entirely from the author's summary : The optimum for the survival of the egg was 18°C. [64·4°F.] and a relative humidity of 80 per cent. Temperatures above 30°C. [86°F.] or below 6°C. [42·8°F.] were lethal. The optimum for the first-instar larva was 18°C. [64·4°F.]. The results regarding humidity were uncertain, but it can be accepted that 100 per cent. favoured larval development. Below this humidity, temperatures above 30°C. [86°F.] or below 4–10°C. [39·2–50°F.] were lethal. The optimum for the second-instar larva below 100 per cent. humidity was between 18 and 23°C. [64·4 and 73·4°F.]. The range of favourable developmental conditions (10 per cent. limit of mortality) was relatively greater than for the first instar. The range of favourable developmental conditions for the pupa was between 18 and 28°C. [64·4 and 82·4°F.]. The pupa was also very resistant to low humidity. Temperatures above 37–38·5°C. [98·6–101·3°F.], or below 5–12°C. [41–53·6°F.] were lethal to it. The weight of female pupae from larvae bred at various temperatures and the average egg-production by the resultant females appeared to increase with a rise in temperature. At 100 per cent. humidity, the average length of the first instar was 31 days at 10°C. [50°F.] and 6 days at 30°C. [86°F.] ; it was longer at reduced humidity. Larval development of the males was quicker than that of the females ; the contrary applied to pupal development. The life of the adults or of starving newly-hatched larvae was shortened at higher temperatures and lower humidities. Resistance to starvation was about the same in the first three instars at various temperatures and 75 per cent. humidity.

Beran (F.) & Watzl (O.). **Untersuchungen über Obstbaumkarbolineen.** [Investigations on Fruit-tree Carbolineums.]—*Z. angew. Ent.* **20** no. 3 pp. 382–414, 11 figs., 12 refs. Berlin, December 1933.

The chemical composition and physical properties of 13 different tar distillates were ascertained, the hydrocarbons, phenols, bases, water-content and specific gravity being determined. Some old-established brands showed great constancy in their characteristics. The stability of the emulsions prepared was found to be generally satisfactory. The effect on stability of the more important substances causing hardness in water was also examined. Tests were made of the toxicity of the

various hydrocarbons, phenols and bases (all dissolved in acetone) to the larvae of *Tenebrio molitor*, L., and adults of *Calandra granaria*, L., in the laboratory, and then to the plum scale, *Lecanium corni*, Bch., in the field, the effect of the tar-distillates on bean foliage and on plum leaf-buds being also examined. It was found that effectiveness (both as regards toxicity to insects and lack of injury to plants) depended largely on the content of tar-oils of high boiling point, especially of the fractions boiling above 270°C. [*cf. R.A.E.*, A **19** 423]. Suggestions for the standardisation, testing and certification of tar distillates are made.

Smirnov (E.) & Wiolovitsh (N.). **Ueber den Zusammenhang zwischen der Populationsdichte und Eierproduktion der Weibchen bei der Schildlaus *Chionaspis salicis* L.** [On the Relation between Population Density and Egg Production by the Females of *C. salicis*.]—*Z. angew. Ent.* **20** no. 3 pp. 415–424, 9 figs. Berlin, December 1933.

In investigations the results of which are about to be published, the senior author and W. Polejaeff found that the average fertility of females of *Lepidosaphes ulmi*, L., decreased as the density of the scale population increased. The work here described was undertaken to ascertain if this rule applied to other Coccids, *Chionaspis salicis*, L., being chosen as being, with *L. ulmi*, the commonest scale in the parks and gardens in Moscow, especially on lime [*Tilia*]. On infested lime twigs collected in the winter of 1931–32, 22 sample areas of 2 sq. cm. were analysed statistically. The number of scales varied from 5 to 221 ; on these extreme samples the average numbers of eggs per female were respectively 47·2 and 15·69 and the percentages of sterile females 0 and 40·9, and the figures as a whole showed an unmistakable inverse correlation between density and egg-production. Like *L. ulmi*, *C. salicis* had two forms of sterile females, *viz.*, a large form with a scale of size similar to that of a fertile female but with a larger body than the latter has after oviposition, and a small form dwarfed in both scale and body.

Kuntze (R.). **Ueber die Verpuppungsweise einiger Parasiten der Kieferneule (*Panolis flammea*) Schiff.).** [On the Method of Pupation of some Parasites of the Pine Noctuid, *P. flammea*.]—*Z. angew. Ent.* **20** no. 3 pp. 425–434, 4 figs., 11 refs. Berlin, December 1933.

This paper describes the method of pupation of four Ichneumonid parasites of the pupae of *Panolis flammea*, Schiff., namely, *Aphanistes armatus*, Wesm., *Ichneumon pachymerus*, Htg., *I. bilunulatus*, Grav., and *Amblyteles vadatorius*, Ill., the material being obtained from Poland.

Beran (O.). **Forstentomologische Untersuchungen aus dem Gebiete von Lunz. III. Untersuchungen über den Verlauf der absoluten Feuchtigkeit in der Kambialzone liegender Fangbäume.** [Forest Entomology Investigations in the Lunz District. III. Investigations on the Course of Absolute Humidity in the Cambium Zone of prone Trap-trunks.]—*Z. angew. Ent.* **20** no. 3 pp. 442–448, 2 figs. Berlin, December 1933.

Further studies in the Lunz district, Austria [*R.A.E.*, A **21** 308] showed that humidity in the cambium of fallen spruce logs was least in

the upper side and greatest in the lower. Its course depended on that of the relative air humidity and particularly on the cambium temperature (direct solar radiation causing a great increase in evaporation). In misty localities, the high humidity will lead to an increased mortality of Scolytids breeding in the cambium zone [*cf.* **20** 49]. Owing to high cambium temperature in the logs under observation, the eggs of *Ips* (*Pityogenes*) *chalcographus*, L., the predominant species, were not laid on the upper side, and there was some mortality of the larvae and pupae on the underside due to humidity.

Prosoroff (S. S.). *Boarmia bistortata* **Goeze als primärer Schädling der Tannenbestände.** [*B. bistortata* as a Primary Pest of Silver Fir Woods.]—*Z. angew. Ent.* **20** no. 3 pp. 463–466, 3 figs. Berlin, December 1933.

The Geometrid, *Boarmia bistortata*, Goeze, not hitherto recorded as an important pest of silver fir (*Abies*), has been found to cause serious damage to *A. sibirica* in Siberia. In the wooded Sayan foot-hills, the main flight occurred at the end of May or in the first half of June. The larvae ceased feeding about mid-July and pupated in the ground-litter beneath the crown-canopy. Most of the pupae hibernated, only a very few adults emerging in autumn. The larvae are extremely polyphagous, attacking various bushes and deciduous trees. In undergrowth, silver fir is generally attacked and not pines or spruce. In slight infestations, only the undergrowth is attacked, and even in severe outbreaks the tips of the crowns of dominant trees remain untouched. In 1932, an average of about 10 pupae were found per sq. ft., with a maximum of over 80. More than half of them were parasitised, chiefly by Hymenoptera. In 300 test areas, the average parasitism was 52 per cent., with a minimum of 24 and a maximum of 90. Infested stands died rather quickly, the weakened trees being destroyed by secondary pests of which the chief were *Monochamus sartor* var. *rosenümlleri*, Cederhj., *Ips* (*Pityogenes*) *chalcographus*, L., and *Xyloterus lineatus*, Ol.

Telenga (N. A.). **Einige neue Braconiden-Arten aus USSR (Hymenoptera).**—*Konowia* **12** no. 3–4 pp. 242–244. Vienna, 30th December 1933.

The four new species described include *Microbracon* (*Bracon*) *kachetinus*, sp. n., bred from *Rhynchites bacchus*, L., in Transcaucasia, and *M.* (*B*) *stschegolevi*, sp. n., in North Caucasus (with var. *rufiventris*, n., in N. Caucasus and Uzbekistan) bred from *Cephus pygmaeus*, L.

[Voloshchuk (V. M.).] **Волощук (В. М.). Zur Biologie der Salbeimilbe** *Phyllocoptes obtusus* **Nalepa.** [On the Biology of the Sage Mite, *P. obtusus*.] [In Russian.]—*C. R. Acad. Sci. U.R.S.S.* (N.S.) no. 1 pp. 24–26. Leningrad, 1933. (With a Summary in German.)

Phyllocoptes obtusus, Nal., is one of the most destructive pests of clary (*Salvia sclarea*) in the Russian Union, sometimes reducing the yield of oil by 50 per cent. In southern Crimea, the eggs, which are laid in batches of 2–3, hatch within 2 days, and the adult stage is reached about a week later and lasts 8–13 days. The overwintered adults appear in April, and galls are formed on the leaves about two

weeks later. There are several generations a year, each lasting about 15 days. Infestation is heaviest in June–July. A sulphur-lime dust destroys 95–100 per cent. of the mites. Since they move about very little, a threatened plot may be safely transplanted about a mile away as a preventive measure.

DE AZEVEDO MARQUES (L. A.). **Tenthredinidae conhecida por " mosca de serra," cuja larva, ou " falsa lagarta " é nociva a varias espécies do genero *Tibouchina* (Biologia de *Bergiana cyanocephala* (Klug 1824) Konow, 1899).** [The Biology of *B. cyanocephala*, a Sawfly of which the Larva is injurious to various Species of *Tibouchina*.] 11 pp., 7 pls. Rio de Janeiro, Minist. Agric., Inst. biol. Defesa agric., 1933.

The sawfly, *Bergiana cyanocephala*, Klug, has been found in the Brazilian States of Minas Geraes and Rio de Janeiro infesting trees of the genus *Tibouchina*, which are a source of timber and bark used for dyeing. The egg-stage lasts 10–12 days, the larval 34–48, and the pre-pupal and pupal together 180. About 80 eggs are laid, and after ovipositing, the female remains near them, guarding them and the newly-hatched larvae. Collection of the eggs, larvae and females is therefore easy. The pupae are found on the ground among dead leaves.

SALMÓN DE LOS HEROS (A.). **Las moscas de la fruta.—Sus daños y su control.** [Fruit-flies. Their Harmfulness and Control.]—*Bol. Direcc. Agric. Ganad. Peru* **3** no. 9–10 pp. 47–80. Lima, 1933. [Recd. January 1934.]

Nine fruit-flies of the genus *Anastrepha* have been recorded in Peru, of which *A. fraterculus*, Wied., and *A. serpentina*, Wied., are the ones generally distributed and abundant [*R.A.E.*, A **21** 83]. This paper deals chiefly with *A. fraterculus*, which is the commonest and infests a variety of fruits, a list of which is given with notes on its bionomics. *A. serpentina* attacks *Lucuma* and, rarely, cherimoya [*Anona*]. An account is given of the measures adopted against Trypetids in various parts of the world, and reference is made to work in Peru against *A. fraterculus* [**19** 497 ; **21** 161].

List of intercepted Plant Pests.—*S.R.A., B.P.Q.* [1933], 64 pp. Washington, D.C., U.S. Dep. Agric., Bur. Pl. Quarant., December 1933.

This list of pests intercepted on imported plants and plant products in the United States, Hawaii and Porto Rico covers the period 1st July 1932 to 30th June 1933.

PEMBERTON (C. E.). **Insect Damage to Sugar Cane Roots in Hawaii.**—*Bull. 4th Congr. int. Soc. Sugar Cane Tech.* no. 4, 1 p. San Juan, P.R., March 1932. [Publ. 1933. Recd. January 1934.]

Anomala orientalis, Waterh., is the only insect, apart from Thysanura and Collembola already noticed [*R.A.E.*, A **20** 304], that attacks the roots of sugar-cane in Hawaii. If it were not checked by the parasite, *Scolia manilae*, Ashm. [**20** 572 ; **21** 492, etc.], it is doubtful whether sugar could be produced at a profit in infested plantations. When 30–70 grubs occur directly among the roots of one stool, root damage may be very severe. As the grubs seem to prefer humus or decaying

vegetation to living roots, much damage to the rhizome of the cane plant is caused, especially in ratoon crops where an abundance of dead rhizome tissue occurs. The grubs often pass beyond the dead areas into live tissues and destroy actual and potential bearing portions of the root and culm. Both in ratoons and plant canes, new underground shoots are frequently eaten out at the base and killed, and a stool may lose a large proportion of its roots through destruction of the old rhizome or other portions of the underground system where new buds or shoots are forming.

Although *A. orientalis* has only been known in Hawaii since 1912, it had probably been present for several years when discovered. It occurs only in 3 contiguous plantations in Oahu, and has not spread more than 10 miles from the point where it was originally found. This is due to the fact that the females deposit almost all their eggs before taking flight, so that spread from year to year is effected by females capable of depositing only one or two eggs each.

LOPEZ (A. W.). **I. An Account of some Scoliid Wasps parasitic on Sugar-cane Grubs in Occidental Negros, Philippine Islands. II. Progress Report on the Exchange of Scoliid Wasps with Australia.**—*Bull. 4th Congr. int. Soc. Sugar Cane Tech.* no. 50, 12 pp., 3 pls., 8 refs. San Juan, P.R., 1932. [Publ. 1933. Recd. January 1934.]

The bulk of this information on work with Scoliids attacking sugar-cane grubs in the Philippines and Queensland has already been noticed [*R.A.E.*, A **20** 326, etc.]. In the first section, the species occurring in Occidental Negros are briefly described, and data on the life-cycles of some of them are given in a table. *Campsomeris aureicollis*, Lep., is comparatively scarce from August to September, when the cane grubs begin to cause considerable damage, and abundant from October to June. During the last four months of this period, few larvae of the hosts, of which *Leucopholis irrorata*, Chevr., is the most important, are available at the right stage for parasite oviposition. In the course of rearing work, the eggs and larvae of the Scoliid were severely attacked by *Rhizoglyphus* sp. and the cocoons by a fungus of the genus *Penicillium*.

SEIN jr. (F.). **Artificial Transmission and other Studies on Sugar-cane Mosaic.**—*Bull. 4th Congr. int. Soc. Sugar Cane Tech.* no. 84, 6 pp. San Juan P.R., 1932. [Publ. 1933. Recd. January 1934.]

Sugar-cane mosaic was transmitted by applying a piece of infected leaf tightly against a leaf of a healthy plant and passing an insect pin rapidly in and out through both, and sometimes by pricking in juices pressed out of infected tissues and spread on healthy leaves. Exposure of the juice to the air before inoculation, however, rapidly destroys its infective properties, apparently by the oxidation of the medium rather than of the virus itself. Cutting into a healthy section of cane with a knife that had just been used to cut into infected cane failed to produce infection. Contrary to the theory of E. W. Brandes [*R.A.E.*, A **11** 289], a mere trace of infective juice introduced into a healthy plant led to indefinite multiplication of the virus. Mature leaves proved to be as susceptible to infection as young and tender ones. The minimum incubation period, previously believed to be 15 days, was found to be 9 days. The absence of chlorophyll may account for

the failure of the virus to survive in the seed. It was found to travel downwards with the elaborated food from the leaves through the phloem to the stalk, but as it was not ordinarily carried upwards, the water and inorganic salts that move upward in the xylem are apparently unfavourable to it. Numerous experiments showed that the virus is not present in the underground roots, and experiments with the Cixiid, *Oliarus franciscanus*, Stål, which was thought to be a possible vector as it sucks the juices of the roots of grasses and sugar-cane in Porto Rico, gave negative results. As the disease can be readily transmitted from and through mature leaves, the ability of *Aphis maidis*, Fitch, to transmit it cannot be attributed to the fact that it feeds on the young and tender ones, nor the inability to do so of *Sipha flava*, Forbes, which is present in large numbers on sugar-cane, to its preference for the older leaves [*cf.* **18** 165].

If it were possible to distinguish between the chemical composition of the liquids in the phloem of the susceptible and resistant varieties, or of strains of varieties that are resistant in one locality and susceptible in another, it might be practicable to turn a susceptible variety into a resistant one by the application of chemical substances to the soil.

Ingram (J. W.). **Minute Soil-inhabiting Animals injuring Sugar Cane in Louisiana.**—*Bull. 4th Congr. int. Soc. Sugar Cane Tech.* no. 85, 3 pp. San Juan, P.R., March 1932. [Publ. 1933. Recd. January 1934.]

Most of the species described in this paper as contributing to root deterioration of sugar-cane in Louisiana have already been noticed [*R.A.E.*, A **19** 674, etc.]. Others include *Euetheola rugiceps*, Lec. [*cf.* **20** 635] and weevils of the genus *Anacentrinus* (*Anacentrus*) [*cf.* **20** 589]. Infestation by minute soil-inhabiting Symphyla and Collembola was reduced by the application to cane rows of semesan, paradichlorobenzene or paradibromobenzene, but none afforded economic control. In a plant-cane field in which rice has been grown, the soil fauna is only about one-fourth of the numbers found after the normal rotation with maize or soy-beans [*cf.* **19** 675], but after one year of a dry-land crop it reaches normal again. Injurious animals were reduced by about 40 per cent. in land drained to a depth of 3–6 feet as compared with land drained in the ordinary way (to about 1 foot). Summer planting, which allows the cane to develop a good root system before the following growing season, lessens injury by them. As it is possible that many of them attack sugar-cane only in the absence of preferred foods, such as fungi, it might be possible to attract them from the cane roots by supplying organic matter to the soil.

Wolcott (G. N.). **The Influence of extreme Climatic Conditions in Peru on Moth-borer Abundance.**—*Bull. 4th Congr. int. Soc. Sugar Cane Tech.* no. 87, 3 pp. San Juan, P.R., March 1932. [Publ. 1933. Recd. January 1934.]

In the lower parts of the coastal valleys of southern Peru, there is a continuous dense fog for 8 or 9 months of the year, and sugar-cane grown entirely during this foggy period is free from infestation by *Diatraea saccharalis*, F. Although rainfall is entirely absent in normal years and the cane depends entirely on irrigation, these heavy, low-lying fogs precipitate so much moisture that the stalks are always

moist. As beyond the fog-belt, further inland or further north, every joint of the cane is often infested, it appears that even a small amount of moisture applied to the stalks is sufficient to drown the larvae. During the few summer months (January–March) when even the coast is in sunshine, infestation increases with amazing rapidity in cane previously free from injury, but is confined mainly to the upper portions, so that the cane as a whole is less affected than that grown in perpetual daily sunshine. As alternative food-plants of the borer are practically non-existent throughout the irrigated region, and large unbroken areas of cane are customarily planted and harvested at one time, it should be possible, by using only uninfested seed cane from the foggy coast, to preserve fields outside the fog-belt from serious infestation.

In an intermediate coastal district, young shoots from seed cane planted at the beginning of the cold weather invariably come up entirely free from injury, whereas from cane planted before the warm weather half the shoots are often destroyed by borers. The effect of cold-weather planting in eliminating the borer was clearly evident for over 18 months, no heavy infestation occurring until the final months before milling. This peculiar adjustment of temperature, which allows the plant to develop although fatal to the borers, probably occurs nowhere else.

In Peru, the old varieties of cane are still almost exclusively grown, but satisfactory returns are obtained owing to the great fertility of the soil. In countries where improved varieties, which are almost invariably more susceptible to infestation, are cultivated, the greater yield obtained may be outweighed by the increasing seriousness of the borer problem.

Wolcott (G. N.). **On Methods of determining Borer Abundance in Cane Fields.**—*Bull. 4th Congr. int. Soc. Sugar Cane Tech.* no. 88, 2 pp. San Juan, P.R., March 1932. [Publ. 1933. Recd. January 1934.]

Methods hitherto employed in estimating the abundance of *Diatraea saccharalis*, F., are vitiated by the divergences in the size of stalks and joints, which make it difficult to express the data obtained in terms of tons of cane per acre or tons of sugar for the use of growers or millers. Figures based on the number of injuries to 100 lb. of cane would be both more exact and more useful. In order to compensate for loss of weight due to larval feeding, the average weight of the tissue consumed by larvae of various sizes and the consequent change in moisture content of the cane must be determined.

Seín, jr. (F.). **Soil Animals and Root Disease in Porto Rico.**—*Bull. 4th Congr. int. Soc. Sugar Cane Tech.* no. 91, 2 pp. typescript. San Juan, P.R., 1932. [Publ. 1933. Recd. January 1934.]

Brief notes are given on Arthropods attacking the roots of sugar-cane in Porto Rico [*cf. R.A.E.*, A **19** 199], and reference is made to the observation that *Oliarus franciscanus*, Stål (*cinereus*, Wolcott) is apparently incapable of transmitting sugar-cane mosaic [**22** 148].

Leonard (M. D.) & Seín, jr. (F.). **Observations of some Factors which may affect the Abundance of** *Diatraea saccharalis* **in Porto Rico.**—*Bull. 4th Congr. int. Soc. Sugar Cane Tech.* no. 92, 2 pp. San Juan, P.R., March 1932. [Publ. 1933. Recd. January 1934.]

The findings of the authors tend to confirm the observations of G. N. Wolcott [*R.A.E.*, A **3** 760] showing that infestation of sugar-cane by *Diatraea saccharalis*, F., in Porto Rico is inversely proportional to the amount of rainfall.

Loftin (U. C.) & Christenson (L. D.). **A Report on the Corn Aphis,** *Aphis maidis* **Fitch, in Cuba.**—*Bull. 4th Congr. int. Soc. Sugar Cane Tech.* no. 115, 20 pp., 4 figs., 14 refs. San Juan, P.R., 1932. [Publ. 1933. Recd. January 1934.]

Aphis maidis, Fitch, is of major importance in Cuba owing to its being the vector of mosaic disease of sugar-cane. Investigations in 1930 (the technique of which is described) showed that the life of the wingless Aphids on *Sorghum* averages 19 days and the number of young deposited daily 5·4, with a total of 35·4, beginning after 5·7 days and continuing for 11·8. The development period of the winged forms is practically the same, but the total life much shorter, an average of only 10·8 young being deposited over 5·4 days. Breeding continues parthenogenetically throughout the year, and no eggs or sexual forms are produced. The production of winged forms, which appears to be small in Cuba, seems to be influenced more by overcrowding and climatic factors than by the form of the mother, the type or quantity of food or the kind of soil. Most of the winged females in cages were killed at 100°F. or over, and though 91°F. was the highest recorded in the central leaf-whorls of *Sorghum*, where the Aphids congregate, it is probable that they may be killed or driven into the whorls by the temperature on the exposed parts of the plant. Even in an area in which the spread of mosaic is slow, a considerable number of Aphids exist on maize and grasses [*R.A.E.*, A **15** 379], notes on which are given, *Pennisetum purpureum* being recorded as a food-plant for the first time in Cuba. These constitute the main reservoir of the winged migrants, which cause the secondary spread of the disease to sugar-cane [*cf.* **17** 467], on which breeding was not observed in the field. Maize is only suitable for a short time, and in fields that are kept free from weeds and well cultivated it is believed that few winged forms are produced on it, though in poorly cultivated land it may be an important source of infestation.

Natural enemies are of comparatively little importance owing to the habit of the Aphids (particularly wingless individuals) of feeding within the protection of the central leaf-whorl. Those observed were : the Syrphids, *Baccha clavata*, F., which was the commonest species and was usually found in rather large colonies, *Ocyptamus scutellatus*, Lw., and *O. dimidiatus*, F., which had pupal periods of 5 and 7 days, respectively, *Allograpta venusta*, Curran, which attacked *Brevicoryne* (*Aphis*) *brassicae*, L., on cabbage, and *Mesogramma subannulatum*, Lw., which attacked *Peregrinus maidis*, Ashm., on *Sorghum*, the two last-named becoming readily adapted to *A. maidis* and having pupal periods of 3–4 and 5 days respectively ; the Coccinellids, *Cycloneda sanguinea*, L., *Scymnus roseicollis*, Muls., which is apparently common in Cuba and had a pupal stage of 5–8 days, *Hyperaspis festiva* var. *apicalis*, Wse., and *Psyllobora nana*, Muls. ; the earwig, *Doru lineare*,

Esch., which probably consumes large numbers of the Aphids ; and the Braconid, *Lysiphlebus testaceipes*, Cress., which also parasitises *Aphis gossypii*, Glov., *B. brassicae*, *Hysteroneura setariae*, Thomas, and other Aphids in Cuba. The highest percentage of parasitism of *A. maidis* by this Braconid was 32·56 on *Sorghum*. The life-cycle of the parasite occupied about a week, as compared with 11 days in Kansas, so that two generations developed to one of the host.

In investigations on the susceptibility of different varieties of sugar-cane to mosaic disease and the factors influencing its transmission, the percentages of infection obtained were in all cases rather low and variable ; the susceptibility of one variety was in direct proportion to the number of Aphids used. The feeding of two Aphids resulted in the appearance of the disease in one variety, but that of one apparently did not. No correlation was found between the number of Aphids feeding on a plant and the incubation period of the disease. It was not transmitted by *H. setariae*, *Sipha flava*, Forbes, *Pulvinaria iceryi*, Guér., or an unidentified thrips.

Seín, jr. (F.). *Anastrepha* (**Trypetidae, Diptera**) **Fruit Flies in Puerto Rico.**—*J. Dep. Agric. Puerto Rico* **17** no. 3 pp. 183–196, 5 pls., 11 refs. Rio Piedras, P.R., 1933.

The author describes two fruit-flies from Porto Rico : *Anastrepha fraterculus* var. *mombinpraeoptans*, n., the preferred food-plant of which is hog-plum (*Spondias mombin*), and which also breeds in fruits of other plants of the same genus, some varieties of mango, and occasionally guava (*Psidium guayava*) and rose-apple, *Eugenia* (*Jambos*) *jambos* ; and *A. unipuncta*, sp. n., which attacks guava, *E. jambos*, *Terminalia catappa*, kumquat (*Fortunella margarita*), star-apple (*Chrysophyllum cainito*), sapodilla (*Achras sapota*), custard-apple (*Anona reticulata*) and beach-plum (*Chrysobalanus icaco*), and also sometimes breeds sporadically and in small numbers in grapefruit and orange in spring and early summer. *A. fraterculus*, Wied., which was originally described from Brazil, has hitherto been considered the only species of its genus in the Island, where it was first recorded in 1887. In 1911, fruit-flies attacking mangos in Porto Rico were identified as *A. acidusa*, Wlk. [*cf.* also *R.A.E.*, A **22** 26], but subsequent comparison by L. O. Howard of the type of *A. acidusa* with material from Porto Rico (which may have represented either of the forms here described) showed the latter to represent a different species, possibly new. The original description of *A. fraterculus* is quoted. The new forms are entirely distinct from each other in the egg and adult stages, and the larvae can be partly differentiated by the fruits in which they are found.

Although *Citrus* is not normally attacked by fruit-flies in Porto Rico, small local infestations by *A. unipuncta* of native sweet orange, grapefruit and sour orange have occasionally been reported, which were not coincident with greater abundance of the flies nor apparently with shortage of the ordinary food-plants. The destruction of the other food-plants occurring in *Citrus* groves would eliminate the danger, and early picking of fruit intended for export would reduce the risk of its being infested. Since the first discovery of infestation, export of *Citrus* fruit from Porto Rico to the United States has been made subject to permit based on inspections made throughout the year in

the groves and again in the packing-houses before shipment [**13** 435]. Since 1931, special attention has been devoted to localities where infestation is likely to occur.

WOLCOTT (G. N.) & SEÍN, jr. (F.). **A Year's Experience with the Cottony Cushion Scale.**—*J. Dep. Agric. Puerto Rico* **17** no. 3 pp. 199–221, 4 pls., 11 refs. Rio Piedras, P.R., 1933.

An account is given of the bionomics and control of *Icerya purchasi*, Mask., in Porto Rico [*cf. R.A.E.*, A **20** 697 ; etc.]. It first appeared in injurious numbers during the exceptionally dry spring of 1932, and it is being gradually dispersed over the island by the prevailing winds from the original focus in the north-east. In *Citrus* groves sheltered by windbreaks, it was entirely eliminated by a fungus, *Spicaria javanica* [*cf. loc. cit.*], not previously recorded from Porto Rico, which attacked it during extremely wet weather in May 1932 and persisted during the following humid summer months. In drier sites, such as on *Citrus* in exposed groves or on *Casuarina* growing close to the sea or planted as a windbreak, *Rodolia* (*Novius*) *cardinalis*, Muls., which was brought to Porto Rico by aeroplane from Florida [*loc. cit.*] and later from New Orleans, has proved reasonably efficient.

The most important native parasite is the Phorid, *Syneura cocciphila*, Coq., originally described from Mexico and never before found in Porto Rico ; the scale is also attacked by *Cheiloneurus pulvinariae*, Dozier, originally described as a hyperparasite of *Pulvinaria iceryi*, Guér., attacking *Euaphycus* (*Aphycus*) *flavus*, How. [**15** 408], and by the Coccinellid, *Decadiomus pictus*, Chapin [**21** 410]. During dry weather, almost perfect control is obtained by spraying with an emulsion of a standard heavy engine oil made with fish-oil soap and with fusel oil as the stabiliser.

Except in particularly sheltered sites, all the large scales and practically all the small ones were carried away and destroyed by a hurricane in September 1932. Those that escaped, however, were able later to increase rapidly, as their natural enemies had also been destroyed, and the hurricane appears to have had no effect on the dispersion of the scale. The ant, *Solenopsis geminata*, F., which began to foster *I. purchasi* as soon as it was introduced, was observed to have built protective structures over the surviving scales, in order to ensure a supply of honeydew.

WOLCOTT (G. N.). **Recent Experiments in the Control of two Puerto Rican Ants.**—*J. Dep. Agric. Puerto Rico* **17** no. 3 pp. 223–239, 6 refs. Rio Piedras, P.R., 1933.

An account is given of experiments in the control of *Solenopsis geminata*, F., and *Myrmelachista ambigua ramulorum*, Wheeler, the most important of the many ants occurring in Porto Rico, 6 species of which are recorded. Against *S. geminata*, which fosters mealybugs on *Citrus* and pineapple, thallium compounds in baits [*R.A.E.*, A **20** 705] proved ineffectual out of doors, though they were successful in every test conducted in the house. It is most readily controlled by a spray of 1 U.S. pint crude carbolic acid and ½ lb. soap in 24 U.S. gals. water, which can be effectively combined (at full or half strength) with oil emulsions used against Coccids.

Against *M. a. ramulorum*, which nests in *Inga vera* and *I. laurina* in coffee groves and sometimes tunnels in coffee trees [**13** 134], a bait consisting of ½ lb. minced steak and 5 oz. thallium acetate was very effective.

Wolcott (G. N.). **The Lima Bean Pod-borer Caterpillars of Puerto Rico.**—*J. Dep. Agric. Puerto Rico* **17** no. 3 pp. 241–255, 1 pl., 6 figs. Rio Piedras, P.R., 1933.

Notes are given on the bionomics of *Maruca testulalis*, Geyer, *Fundella cistipennis*, Dyar, and *Etiella zinckenella*, Treit., injury by which is the chief factor limiting the profitable production of lima beans in Porto Rico [*R.A.E.*, A **19** 488], with characters distinguishing them. The eggs of all three species are laid on the flower sprays [**19** 569], and the young larvae feed on any of the floral parts, causing the fall of buds, flowers and young pods. The older larvae enter the larger pods, which do not fall to the ground, and continue to feed within them till they are full-grown, when their rotted excreta show through the walls of the pods, making them unmarketable. Small larvae often remain undetected when the pods are shipped and continue to feed while they are in transit. Hand-killing of larvae that crawl out during packing for shipment and destruction of discarded pods are the only practical measures, if the standard of consignments is to be maintained, though larvae in the pods can be killed by moist heat or fumigation with carbon bisulphide [**18** 507].

Although *M. testulalis* is of great importance on account of the quarantine restrictions that permit the export of beans from the West Indies to the United States only during the winter and under special permit, *F. cistipennis* and *E. zinckenella* are much more abundant and cause much heavier losses in Porto Rico. The larvae of *M. testulalis*, unlike those of the other two Pyralids, keep an exit open in the bean through which they void their excrement, so that the grower is able to recognise infested pods. The larvae of *F. cistipennis* attack lima beans only in winter, when they are being shipped to northern markets, whereas those of *E. zinckenella* occur in abundance only in spring, summer and autumn, when no shipments can be made on account of quarantine restrictions. The range of these two species is known to overlap only in Porto Rico. *F. cistipennis* was originally described from Barbados and has since been found in St. Vincent, St. Croix, Vieques and Haiti, whereas *E. zinckenella* is of cosmopolitan distribution, though in the West Indies it occurs only in Cuba and Porto Rico.

Larvae of *E. zinckenella* are also common in the pods of *Crotalaria incana*. *F. cistipennis* attacks pods of sword beans (*Canavalia ensiformis*) and beach beans (*C. maritima*), often causing much more obvious external injury than to lima beans. In Porto Rico, *M. testulalis* is much more abundant in *C. ensiformis* than in lima beans [*cf.* **19** 488]. Larvae of *F. cistipennis* also burrow in the stems of cowpeas [*Vigna*] and attack the young shoots and buds. Both *E. zinckenella* and *F. cistipennis* pupate in the soil at considerable depths, but not in hampers or rubbish on the surface of the ground like *M. testulalis*. One larva of *F. cistipennis* was parasitised by *Perisierola* (?) *cellularis*, Say, and several of *E. zinckenella* by *Heterospilus etiellae*, Roh.

Experiments with sprays of Bordeaux mixture, with or without magnesium arsenate [*cf.* **19** 570], or of nicotine or pyrethrum, and with trap-rows of alternative food-plants failed to reveal any promising method of control.

Wolcott (G. N.). **The Larval Period of** *Diaprepes abbreviatus* **L.**—*J. Dep. Agric. Puerto Rico* **17** no. 3 pp. 257–264, 1 pl., 2 refs. Rio Piedras, P.R., 1933.

Diaprepes abbreviatus, L., is found in the West Indies from Barbados to Santo Domingo, injuring various economic plants, especially *Citrus* and sugar-cane, in both adult and larval stages. The adults live above ground, feeding on tender leaves, and lay their eggs in clusters of from 10–12 to several hundreds between two older leaves glued together. The larvae hatch in 6–10 days and wriggle out between the leaves, dropping at once to the ground in which they burrow. They feed only on living vegetable tissue, attacking all kinds of plant roots. After a larval period presumed to last almost a year, they pupate in cells at some depth in the soil. The pupal stage lasts about 15 days, but the adults may remain for some time longer in the pupal cells. In Barbados, this weevil is practically restricted to sugar-cane [*cf. R.A.E.*, A **2** 531 ; etc.].

A larval period of 261–336 days was observed in Barbados, but in Porto Rico it ranged from 202 days to over a year, the number of instars varying from 6 to 16. Development was much more rapid in experiments at one place in the Island than in another and appeared to be generally rather more rapid during cooler weather. The mortality of larvae fed exclusively on maize was greater than that of those fed also on sword beans [*Canavalia ensiformis*]. The larval period falls into two parts : the first is a period of constant and rapid growth, extending normally from hatching to about the beginning of the eighth instar ; the second, during which the size and weight of the larva remain constant or tend to decrease, is of equal or even greater length. In the first period, the larva feeds continuously ; in the second, it eats little or nothing. It is probable that under normal conditions the second period, in which individual variation is even more marked than in the first, ends in the death of most of the larvae. All the activities of *D. abbreviatus* occupy less than half the year, but the waiting-period before pupation prolongs the life-cycle so that it fits within the seasonal limits of a year. This suggests that the weevil would be better adapted to a climate inducing a long period of hibernation or aestivation, although in Porto Rico all stages are apparently present throughout the year. Up to the middle of the fifth instar, the larvae are too small to cause serious damage to plant roots, and their rapid growth in the first two months results in no obvious injury to well-established plants, but their feeding in the following month involves a maximum amount of injury. After this, although the larvae are still present in the soil, no further damage is caused.

Wolcott (G. N.). **The changed Status of some Insect Pests in Puerto Rico.**—*J. Dep. Agric. Puerto Rico* **17** no. 3 pp. 265–270, 2 refs. Rio Piedras, P.R., 1933.

Though some of the insect pests of crops in Porto Rico, such as *Lepidosaphes beckii*, Newm., on *Citrus* and *Scapteriscus vicinus*, Scud.,

show little or no change in their status over the entire period during which entomological observations have been recorded, changes have occurred in the incidence of some more recently introduced pests. *Icerya purchasi*, Mask. [*cf. R.A.E.*, A **22** 152] reached maximum abundance on *Citrus*, etc., in the late spring of 1932, and *Coccus viridis*, Green, became noticeably destructive to coffee after the hurricane of 1928 [**17** 668]. *Platyedra* (*Pectinophora*) *gossypiella*, Saund., and *Cosmopolites sordidus*, Germ., which appeared almost simultaneously in Porto Rico in 1921 on cotton and bananas respectively [**11** 230], now occur in practically every locality where their food-plants are present. *Cylas formicarius*, F., although a serious pest of sweet potato in the poor hilly lands of the interior, is of comparatively little importance on the richer soils near the coast, where the food-plant grows more rapidly and is protected by the absence of cracks in the soil through which the roots become accessible. *Euscepes batatae*, Waterh., which also attacks sweet potatoes, is still confined to limited areas, and the distribution of the papaya fruit-fly, *Toxotrypana curvicauda*, Gerst. [**19** 366] is similarly restricted.

The hurricane of 1928 almost eliminated *Myrmelachista ambigua ramulorum*, Wheeler, which during the preceding 29 years, in which no destructive hurricanes reached the Island, had become very numerous in old trees in the coffee groves [**22** 153]. The numbers of this ant are increasing again gradually as freshly planted shade trees attain considerable size. Cotton planted by coffee-growers in an attempt to recoup themselves for losses caused by the hurricane, suffered from increasing infestation by *Alabama argillacea*, Hb., and *P. gossypiella*, which involved almost the whole crop for 1931–32 [**21** 647]. The growing of cotton was then abandoned, and the numbers of cotton insects dwindled, particularly as the hurricane of 1932 eliminated almost the only important alternative food-plants along the north coast, but *P. gossypiella* still persists wherever self-sown cotton occurs.

The most obvious change has recently occurred in the status of white grubs [*Lachnosterna*], which 15–20 years ago were serious pests of nearly every crop grown on the Island but are now almost entirely eliminated, mainly owing to the widespread dispersal of the toad, *Bufo marinus* [**21** 235]. *Diaprepes abbreviatus*, L., which at times and locally has been even more injurious to sugar-cane than white grubs, seems to be waning slightly, one of the factors in its decrease being an egg-parasite, *Tetrastichus haitiensis*, Gah. This weevil also forms one-eighth of the food of *B. marinus*, which is likely to be an important factor in any further decrease in its numbers.

ALVARADO (J. A.). **Enfermedades del cafeto.** [Diseases of Coffee.]—*Rev. agríc.* **11** no. 10 pp. 611–614, 2 pls. Guatemala, 30th November 1933.

Leucoptera coffeella, Guér., is widely distributed on coffee in Guatemala. The eggs are laid in groups of 2–7 on the lower surface of the leaves and hatch in 2–3 days. The larvae mine in the leaves for 30–40 days, and then emerge and spin cocoons on the lower surface. The pupal stage lasts 6–11 days. The larvae may be crushed in the leaves, or the latter may be plucked, but it is preferable to destroy the pupae by spraying the lower surface of the leaves with kerosene

emulsion at intervals of 20–30 days. Fires in the field attract and kill the moths, and they are also killed by heavy rain if caused to fly out by shaking the bushes.

Newcomer (E. J.) & Carter (R. H.). **Studies of Fluorine Compounds for Controlling the Codling Moth.**—*Tech. Bull. U.S. Dep. Agric.* no. 373, 23 pp., 1 fig., 12 refs. Washington, D.C., October 1933.

This is a full and detailed account of laboratory and field experiments carried out in 1925–30 in Washington State on the use of fluorine compounds for the control of the codling moth [*Cydia pomonella*, L.] on apple. Briefer papers on them have already been noticed [*R.A.E.*, A **19** 366; **20** 56].

Lockwood (S.). **Insect and Mite Scars of California Fruits.**—*Mon. Bull. Dep. Agric. Calif.* **22** no. 7–11 pp. 319–345, 12 figs., 19 refs. Sacramento, Calif., 1933.

Notes are given on the scars caused on the ripening fruits of deciduous trees, vines, *Citrus* and avocado in California under the insects or mites responsible.

Mackie (D. B.) & Haenggi (C.). **Recent Developments in Elm Leaf Beetle Control.**—*Mon. Bull. Dep. Agric. Calif.* **22** no. 7–11 pp. 346–350, 2 figs. Sacramento, Calif., 1933.

The elm leaf beetle [*Galerucella luteola*, Muls.] is spreading rapidly in the eastern Sacramento Valley and adjacent districts in the foothills of the Sierra Nevada [*cf. R.A.E.*, A **19** 691], where it constitutes an important problem. In Sacramento City, where the beetle first appeared in 1930, it was found quicker to spray shade trees at night, and 1½ lb. zinc arsenite proved a cheap and effective substitute for 4 lb. lead arsenate in a spray of 1 U.S. pint fish-oil and 100 U.S. gals. water.

Plank (H. K.). **Damage caused by Bean Worms and some important Problems connected with their Control.**—*Mon. Bull. Dep. Agric. Calif.* **22** no. 7–11 pp. 366–378, 6 figs. Sacramento, Calif., 1933.

In September–October 1932, a considerable reduction of the crop of beans in the centre of the northern bean-producing area of California was caused owing to damage to the pods by *Heliothis obsoleta*, F., *Estigmene acraea*, Drury, *Cirphis unipuncta*, Haw., *Phytometra* (*Autographa*) *californica*, Speyer, *Agrotis ypsilon*, Hfn., *Strymon melinus*, Hb., and *Prodenia praefica*, Grote, here given in order of their apparent importance. During middle and late September, arsenical dusts, principally one of 14 per cent. calcium arsenate, 30 per cent. sulphur and 56 per cent. hydrated lime, were applied to some fields at the rate of 25 lb. per acre by a ground machine or aeroplane. They were applied too late to be of maximum benefit, but stopped further development of the insects and prevented late damage to the beans. Considerable injury was caused to the foliage in some instances, particularly where uneven application had resulted in heavy accumulations on the leaves. Injury due to arsenicals appears to be aggravated by moisture, and that due to sulphur by high temperature, especially when combined with high humidity.

Owing to the extremely variable conditions prevailing in most of the bean-growing regions of California, the use of arsenicals is not advised for the control of insects on beans. Moreover, the residue remaining on the straw, even after threshing, renders it unsuitable as food for animals. Experience indicates that barium fluosilicate and possibly cryolite are the only materials that can be used with safety. They should be applied at the rate of 8 lb. of the dry active material to an acre (alone or with a carrier) when the larvae are small and have not caused much injury, but where the straw is to be used for stock even these materials should be used with caution. It is highly advisable to plough under the straw during the winter, as it will improve the condition of the soil and kill many of the hibernating insects.

Ebeling (W.). **Some Difference in Habits and Structure between Citrus Thrips and Flower Thrips.**—*Mon. Bull. Dep. Agric. Calif.* **22** no. 7–11 pp. 381–384, 2 figs. Sacramento, Calif., 1933.

In 1932, damage by *Scirtothrips citri*, Moult. (citrus thrips) reduced the market value of about 30 per cent. of the navel oranges in some districts in southern California, where as much as 90 per cent. of the fruit was affected in some groves. In 1933, however, it was comparatively scarce. A description is given of the structural characters distinguishing this species and *Frankliniella californica*, Moult. (flower thrips), with which it may be easily confused. *F. californica* is abundant in the blossoms of *Citrus*, in which *S. citri* rarely occurs, but when they fall, both species may be found together on the foliage for a short time. Thrips observed after 1st July are almost certain to be *S. citri*. In an experiment, *F. californica* was not found to injure the fruit or foliage of navel oranges [*cf. R.A.E.*, A **21** 604].

Keifer (H. H.) & Jones (L. S.). **Some Parasites of *Anarsia lineatella* Zell. in California.**—*Mon. Bull. Dep. Agric. Calif.* **22** no. 7–11 pp. 387–388. Sacramento, Calif., 1933.

The following parasites were reared from *Anarsia lineatella*, Zell. (peach twig-borer) in one locality of California during 1932 and the first half of 1933 : the Ichneumonids, *Pimpla* (*Ephialtes*) *sanguinipes*, Cress., *P.* (*Itoplectis*) *obesa*, Cush., *Dicaelotus pacificus*, Ashm., and *Aenoplex phryganidiae*, Ashm., which may be a secondary parasite ; the Eulophid, *Secodella cushmani*, Cwfd. ; the Pteromalids, *Dibrachys cavus*, Wlk. (*boucheanus*, Ratz.) and *Pseudomicromelus deplanatus*, Nees, which emerged in considerable numbers, this being the first record of its occurrence outside Europe ; two individuals of the Eupelmid, *Tineobius californicus*, Ashm., which is rare and for which no host has previously been known, and a few of *Eupelmus* sp. near *brevicauda*, Cwfd. ; and the Chalcid, *Spilochalcis torvina*, Cress.

Cox (A. J.). **Facts concerning the Spray Residue Problem pertinent to the Fruit and Vegetable Industries.**—*Mon. Bull. Dep. Agric. Calif.* **22** no. 7–11 pp. 389–396. Sacramento, Calif., 1933.

The author discusses the importance of treating celery, apples and pears in California for the reduction of the residue remaining after the application of lead arsenate against insect pests (particularly the codling moth [*Cydia pomonella*, L.] on the last two). If the arsenical

residue is reduced to 0·008 gr. As_2O_3 per lb. (the accepted tolerance being 0·01 gr.), this should ensure that the residue of lead does not exceed the tolerance, which has been fixed at 0·02 gr. for the 1933 crop only [*cf. R.A.E.*, A **21** 475]. The process of washing the fruit and various materials tested as substitutes for a solution of hydrochloric acid and salt [**19** 307] (which is the most effective in California) and their relative efficiency are discussed. Fruit should be washed as soon as possible after picking, as stored fruit develops a greater amount of natural wax, which hinders residue removal. A plan is described for the analysis and certification of treated fruit at the point of origin.

Essig (E. O.). **Economic Importance of the Genus** *Brachyrrhinus* (*Otiorrhynchus*).—*Mon. Bull. Dep. Agric. Calif.* **22** no. 7–11 pp. 397–409, 2 pls., 8 figs., 3 refs. Sacramento, Calif., 1933.

Information is given on the importance, food-plants, methods of dispersal and control of weevils of the genus *Otiorrhynchus* (*Brachyrrhinus*), which are favoured by cold, wet climates, being found chiefly in the Palaearctic region, and are therefore unlikely to thrive in North America except in a limited area. Lists are given of the species of economic importance in Europe on forest trees and native shrubs and on ornamental plants, fruits and vegetables, and of those that have been introduced into other countries, with brief notes on the species occurring in California [*R.A.E.*, A **19** 654].

McKenzie (H. L.). **Observations on the Genista Caterpillar** *Tholeria reversalis* **Guenée (Lepidoptera-Pyralidae).**—*Mon. Bull. Dep. Agric. Calif.* **22** no. 7–11 pp. 410–412, 3 figs. Sacramento, Calif., 1933.

Tholeria reversalis, Gn., has recently caused considerable damage to genista (*Cytisus canariensis*) and other garden plants throughout southern California, where it has been present for at least three years [*cf. R.A.E.*, A **20** 173]. The moths cling to the lower parts of the plants during the day and are attracted to lights at night. Large numbers of eggs are laid on the lower surface of the leaves. The larvae feed voraciously and may defoliate the stems. If disturbed, they drop to the ground. They pupate in thin white cocoons in crevices round buildings or in the ground. There are several generations a year, and the winter is probably passed in the pupal stage. The only parasite observed was *Pimpla* (*Ephialtes*) *sanguinipes*, Cress. The larvae may be controlled by two applications of a spray of 4–6 tablespoonfuls of synthetic cryolite to 1 U.S. gal. water or a dust of 30 per cent. synthetic cryolite and 70 per cent. diatomaceous earth, which, however, leaves an objectionable white residue. Sprays of 3 lb. lead arsenate to 100 U.S. gals. water were not effective.

[Golubeva (M. M.), Obolenskiĭ (S. I.), Meĭer (N. F.) & Pospelov (V. P.).] **Голубева (М. М.), Оболенский (С. И.), Мейер (Н. Ф.) и Поспелов (В. П.). Biological Method of controlling Pests of Agriculture.** [*In Russian.*]—Demy 8vo, 192 pp., 90 figs., many refs. Moscow, Sel'khozgiz, 1933. Price 3 *rub.* 50 *kop.*

This textbook, which is intended for use in schools in Russia, comprises the following papers: "The Use of Predatory and Parasitic

Insects in the Control of Agricultural and Forest Pests," by N. F. Meĭer, pp. 7–89; "Vertebrates as Destroyers of noxious Animals," by S. I. Obolenskiĭ, pp. 90–133; "The Microbiological Method of controlling noxious Insects," by V. P. Pospelov, pp. 134–172; and "The Bacteriological Method of controlling Rodents," by M. M. Golubeva, pp. 173–192.

In the first, the author reviews the history of biological control of insect pests in various countries, particularly the United States, and discusses the problems involved and the methods used in the introduction and mass-breeding of beneficial species, with general notes on the relations between parasites and their hosts, the morphology of the chief families of Hymenopterous parasites and the bionomics of the more important species.

Part of the second paper (pp. 105–122) deals briefly with insectivorous mammals, reptiles and Amphibia and at some length with birds and measures for protecting beneficial species.

The third deals with the diseases of insects caused by bacteria, fungi and Protozoa, and experiments carried out in Russia and elsewhere on the artificial dissemination of pathogenic organisms for the control of insect pests.

In a preface, N. V. Kovalev compares agricultural, chemical and biological methods of controlling pests, and expresses the opinion that the last-named method can generally be considered only a supplementary one.

Roncoroni (E.). **Conoscere l'insetto.** [Know the Insect.]—Med. 8vo, 316 pp. 36 pls. Varese, Consorzio obblig. prov. Lotta contro il Maggiolino, 1933. [Recd. March 1934.]

This volume, which is for free distribution locally, is designed to enlist interest in insects and their habits as a necessary preliminary to the intelligent control of agricultural pests. The first part deals with collection, breeding and preservation of insects, and outlines the principles of control. The second describes the various activities of insects and discusses the ways in which they are beneficial or injurious, and the third gives details of the life-history of some of the insects that are pests in Italy. The book is illustrated with a number of original photographs.

Papers noticed by Title only.

Norris (M. J.) (Mrs. O. W. Richards). **Contributions towards the Study of Insect Fertility.—I. The Structure and Operation of the Reproductive Organs of the Genera *Ephestia* and *Plodia* (Lepidoptera, Phycitidae). II. Experiments on the Factors influencing Fertility in *Ephestia kühniella* Z. (Lepidoptera, Phycitidae).**—*Proc. zool. Soc. Lond.* **1932** pt. 3 pp. 595–611, 5 pls., 20 refs.; **1933** pt. 4 pp. 903–934, 16 refs. London, September 1932 & December 1933.

Priesner (H.). **Ergänzungen und Berichtigungen zu meinem Werke: "Die Thysanopteren Europas."** [Additions and Corrections to my Work: "The Thysanoptera of Europe."]—*Konowia* **12** no. 3–4 pp. 300–306, 2 figs. Vienna, 30th December 1933. [*Cf. R.A.E.*, A **16** 372.]

BÖRNER (C.). **Aphidoidea, Blattläuse.** [Keys to genera represented in Germany.]—*In* BROHMER (P.) *Fauna von Deutschland* 4. Aufl. pp. 197–208, 3 pls. Leipzig, Quelle & Meyer, 1932. [Recd. January 1934.]

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HINDS (W. E.) & OSTERBERGER (B. A.). **Sugarcane Borer** [*Diatraea saccharalis*, F.] **Control by Field Colonisation of** *Trichogramma minutum* **in Louisiana.**—*Bull. 4th Congr. int. Soc. Sugar Cane Tech.* no. 52, 6 pp., 8 refs. San Juan, P.R., March 1932. [Publ. 1933. Recd. January 1934.] [*Cf. R.A.E.*, A **21** 225.]

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TUCKER (R. W. E.). **The Status of** *Trichogramma* **as a Control of** *Diatraea saccharalis* **in Barbados.**—*Bull. 4th Congr. int. Soc. Sugar Cane Tech.* no. 102, 6 pp., 8 refs. San Juan, P.R., March 1932. [Publ. 1933. Recd. January 1934.] [*See R.A.E.*, A **20** 402.]

SEVERIN (H. H. P.) & FREITAG (J. H.). **Some Properties of the Curly-top Virus** [transmitted by *Eutettix tenella*, Baker].—*Hilgardia* **8** no. 1 pp. 1–48, 63 refs. Berkeley, Calif., October 1933.

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